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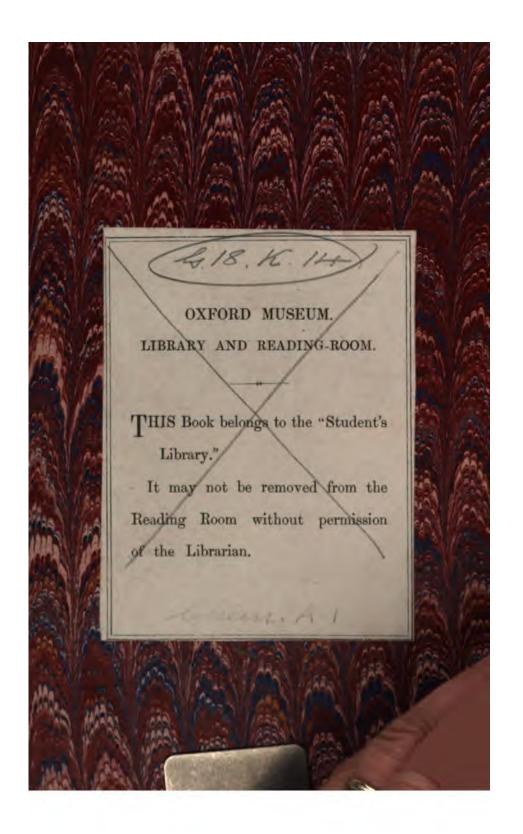
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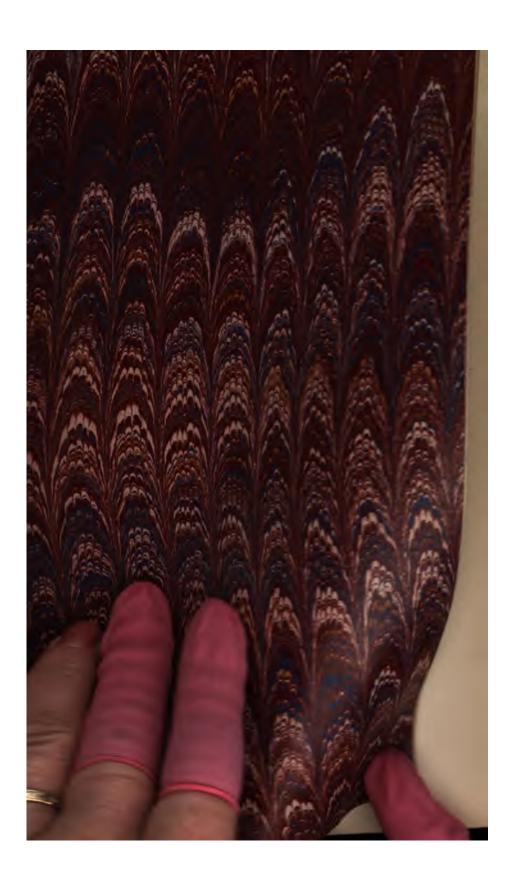
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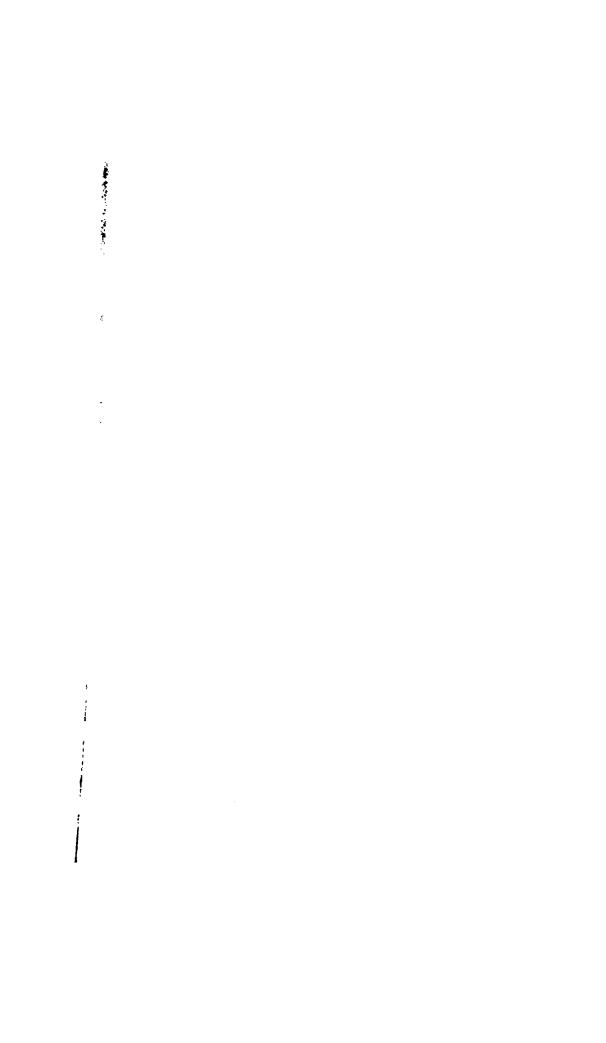
WORKS

OF THE

CAVENDISH SOCIETY.



FOUNDED 1846.



HAND-BOOK

OF

CHEMISTRY.

BY

LEOPOLD GMELIN.

VOL. XIV.

ORGANIC CHEMISTRY,

VOL. VIII.

ORGANIC COMPOUNDS CONTAINING TWENTY AND TWENTY-TWO ATOMS OF CARBON

TRANSLATED BY

HENRY WATTS, B.A., F.C.S.

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VOL. XIV.

From Some Some Series of the South Series Series Series Center, Series S

Labour remajour Francisco y Santonicos. Laurent. Pro-iglio implementes. Acrossog Bertelina. Francisco Georgeon. Emirrio y Santonic. Kalbe.)

Dispersent is trained will by increase 1979, recognised by Reichenbuch as one of the property of terroseposation by land, if the distribute from cond. Faraday terrosects for transposation of magnification, and, as well as Remains and Laurent, association to terroston.

I rention. A. Tey immenty produced in the dry distillation of regime votice expensity when incomposition made piece as a very high improvement.

I am L'ayene. Le a sei leux delines que spille up into marchgo out me s'evenou legres s'evanilles, les comming on the avenge 200 p. C. and 3 C. p. II. and accordingly having marly the composition of magnifically.—This are simulates deposits crystals of magnification supercolly when the more voluntle part is evaporated off:

The marsh-gas a mixed with undecomposed electron gas and hydrogen, the state arrang teem formed by the decomposition of the tax into a produce out account at a white hear, electron gas yields only those two produces out to tax. Magnus.

2. By saming the report of classic after, well-oil or of electrical oils.

2 My saming the regions of similar, etier, rest-of, or of essential oils stronge a retirent parentle table. Sammere Bertheise.) Charcoal and entry remains to see the wise produced in this operation. (Reichenbach.) Noveme, promptle aeologic, and other products are likewise formed, and, as we see the amphibalia, are in part simply confirmed and partly collected in since and, and obtained as nitrobenness, mitro-naphibalia, &c. (Normana.)

When Acres Acid. If rapour of acetic acid be passed through a section of presents the filled with fragments of pemice, naphthalin and a section yearstry of undecomposed acetic acid condense in the receiver, together was a brown oil which forms pieric acid with nitrie acid. (Received.)

4. Naphthain is lound amongst the decomposition-products of camthen, the vapors of which has been passed over strongly ignited lime, and evidences in the receiver in fine, perfectly pure crystals. (Fremy.)

Naphthalin is found, in quantity varying according to the circumstance under which the decomposition takes place, amongst the products of the dry distillation of coal, compare in 135.) (Garden, Laurent); of fut role when illuminating gas is prepared from them (A. Connel); of rouns, when fused and dropped into red-hot cylinders (Pelletier & Walter, Suphthalin is produced, not by the carbonization of coal, but by the decomposition of the first formed distillation-products,

when these products in the state of liquid or vapour come in contact with the red-hot sides of the retorts (vapour-carbonization). It is for this reason that no naphthalin is obtained on distilling coal in iron retorts, of which only the bottom is heated, while the sides are protected from the heat; or when the products of distillation are repeatedly rectified, or cooled to —20°; or acted upon by chlorine (as Dumas affirms) (Reichenbach). Neither is naphthalin produced by distilling tarry residues or wood (Reichenbach), or lignite (Schwarz), if a very strong heat be avoided. — Naphthalin exists ready formed in commercial coal-tar (Garden, &c.); but not invariably (Laurent), (which is owing, not, as Laurent supposed, to varying age, but to the different modes of preparation) (Reichenbach). Coal-tar sometimes contains \(\frac{1}{4}\) of its weight of naphthalin, and sometimes only traces (London tar contains large quantities) (Mansfield, Chem. Soc. Qu. J. 1,248). Tar prepared by distilling coal in iron retorts (in the manner formerly adopted for the preparation of gas), contains but little naphthalin. If retorts of Charmotte clay are employed instead of iron, the tar contains considerable quantities of naphthalin, and a little volatile oil, formed either by the decomposition of the naphthalin, or of the gas itself. (Schwarz.) — Kidd obtained naphthalin by dropping coal-tar upon red-hot iron cylinders. — Naphthalin is found in lamp black, to which it imparts its peculiar odour, and may be separated by simple distillation, or by distillation with water. It is also found in the soot obtained by the burning of wood-tar (Reichenbach); likewise in the vapour which penetrates into rooms from leaky stove-flues (Berzelius), since a deposit of soot is produced by the red hot flue. (Reichenbach.) — Dumas believed that naphthalin exists ready-formed in coal, but Reichenbach showed that this is not the case.

this is not the case.

B. By synthesis, from inorganic substances. Since olefant gas may be formed from inorganic materials,—and from olefant gas, alcohol and then acetic acid may be produced, the modes of formation of naphthalin

A, 1, 2, and 3 may be regarded as syntheses of this description.

1. If a perfectly pure and dry mixture of bisulphide of carbon vapour and sulphuretted hydrogen, or a mixture of these two gases and carbonic oxide, be passed over porous copper or iron at a dull red heat, the products obtained are: a little naphthalin and empyreumatic oil, much hydrogen, marsh-gas, and olefiant gas, and a residue of sulphide of copper mixed with charcoal. (Berthelot.) Perhaps this mode of formation is identical with that from olefiant gas (A, 1), olefiant gas being probably produced, in the first instance and yielding naphthalin (Carius), by its decomposition.

2. When vapour of dichloride of carbon (viii, 160) mixed with hydrogen, is passed through a glass tube filled with fragments of pumice, at a bright red-heat, it yields large quantities of naphthalin. (Berthelot.)

Preparation. Naphthalin is obtained in large, but varying quantities as an almost useless by-product in the distillation of tar on the large scale, especially of that from coal; but it is also a product of the distillation of wood, lignite, and animal offal. (Comp. Benzene, xi, 135.)

distillation of wood, lignite, and animal offal. (Comp. Benzene, xi, 135.)

1. Tar (whether produced from wood, coal, or animal refuse) is first distilled with steam, as long as naphtha (light naphtha), of sp. gr. 0.91 at the utmost, is obtained, and afterwards with the aid of heat, whereupon water and oil of naphthalin (dead oil, heavy naphtha) pass over, until this latter attains a sp. gr. of 0.99. Every 100 gallons of the distillate

last obtained are now intimately stirred up with 15 gallons of oil of vitriol (sp. gr. 1.83) and allowed to settle, after which the clear upper liquid is decanted. This is stirred up with one-tenth of its volume of caustic alkali-solution of sp. gr. 1.35, and after it has been completely neutralized, the whole is allowed to settle. The upper layer is then neutralized, the whole is allowed to settle. The upper layer is then poured off and distilled alone, until the distillate attains a sp. gr. of 0.94. If this first distillate be now mixed in a still with quick lime (1 pound of lime to every gallon of oil), and distilled at a gentle heat, it yields, first a light oil till the sp. gr. reaches 0.91; and if the receiver be then changed and the remainder collected by itself, and cooled to — 4° C, it deposits naphthalin, which may be purified by filtration and pressure. If the distillation of the crude oil of naphthalin be continued in another still, as long as anything passes over, the purified heavy oil of naphthalin is obtained, which, if treated in a similar manner with lime, yields an additional quantity of naphthalin. (G. Shand & A. Maclean, Chem. Gaz. 1854, No. 270; Dingler pol. J. 133, 309.)

The black flaky masses which are deposited on the ground in places

where coal-tar is heated in open pans in order to free it from water, consist, according to Schwarz, of almost pure naphthalin. Coal-tar which has been subjected to heat in the above-mentioned process, yields by distillation two oils, one of which distils at 160° C and contains 0.46 p. c. naphthalin, while the second passes over between 160° and 220° C, and contains 0.65 p. c. naphthalin. Crude tar, which has not been previously heated, yields by distillation, first a light oil together with strongly ammoniacal water; then between 210° and 230° C, after the water has been driven off, so large a quantity of naphthalin, that the distillate, if collected in a separate receiver, assumes at ordinary temperatures the consistence of butter. (Schwarz.) — Garden obtained naphthalin by distilling coal-tar, the naphthalin passing over with the empyreumatic distilling coal-tar, the naphthalin passing over with the empyreumatic oil, from which it was afterwards deposited. - When coal-tar is distilled, but little naphthalin passes over at first, the quantity gradually increasing till the operation is half over, and then again becoming less; the greatest amount passes over with the last portions of the distillate, insomuch that these become completely solid in the receiver (the final products contain sulphur); 100 gallons yielded 5 lbs. naphthalin. If the distillation be hastened a larger quantity is obtained; but if oil of vitriol be added

to the tar, little or no naphthalin is produced. (Chamberlain).

2. Coal-tar is boiled in a copper kettle till all the water is driven off (which would otherwise cause the retort to crack), and then distilled in a glass retort to half its bulk. The naphthalin is separated from the distillate: α by cooling to -10° C, whereupon large quantities of naphthalin, mixed with a small quantity of a yellow unctuous substance, are deposited. The product is collected on fine linen and pressed. -b. The following is a better method: the distillate is placed in a tubulated retort through which chlorine gas is passed for four days, whereupon it becomes hot, evolves hydrochloric acid gas and vapours having an offensive odour (if the condenser be cooled to 0° C. these vapours condense to a wine-red liquid), and finally assumes the dark colour of tar. The product is washed with water, which removes hydrochloric acid and bad smelling bodies, and distilled alone, the distillate being collected in two portions. Both of these, when cooled to -10° C. deposit large quantities

of naphthalin. (Laurent, Ann. Chim. Phys. 49, 214.)

When commercial coal-tar oil is submitted to fractional distillation, the portion passing over between 170° and 190° C. deposits a very large

amount of naphthalin (20 lbs. of oil yields 5 lbs.) which may be collected on a filter, drained, and distilled. (Laurent, N. Ann. Chim. Phys. 3, 296.)

4. Coal-tar is passed through red-hot iron tubes, and the thin tar, obtained by the condensation of the vapours, is distilled, whereupon first water and oil, then naphthalin pass over. (Kidd.)—5. Coal-tar (especially such as has been long exposed to the air) is heated with chloride of lime, water, and oil of vitriol. Much naphthalin is evolved with the steam. (Brook.)

Purification. Commercial naphthalin, or naphthalin prepared by any of the above described methods, is generally contaminated with varying proportions of an empyreumatic oil which turns brown on exposure to the air (as well as by a yellow unctuous substance, Laurent). To free naphthalin from these impurities, the following processes may be employed:

a. Sublimation. 1. The naphthalin is gently heated in retorts or other suitable vessels, and the vapours are collected in wooden chambers, wherein they condense in white follows.

a. Sublimation. 1. The naphthalin is gently heated in retorts or other suitable vessels, and the vapours are collected in wooden chambers, wherein they condense in white flakes. (G. Shand & A. Maclean.)—2. About half a pound of crude naphthalin is gently heated for several hours on the sand-bath in a large porcelain dish, over which a sheet of filter-paper has been pasted; after the whole has cooled, the dish is found to be full of dazzling white crystals of naphthalin. These are removed and the remaining cake of naphthalin pressed with blotting paper (in order to soak up the oil), and again heated, the operation being repeated as long as any sublimate is obtained. The last portion is yellow. This is the only method of obtaining pure, colourless naphthalin. (Otto, Ann. Pharm. 93, 383.)

b. Washing with cold alcohol and recrystallizing from hot alcohol. (Garden, Laurent.) The most convenient method is to put the powdered naphthalin upon 4 or 5 funnels (without paper) placed one above the other, and to pour the alcohol upon the uppermost; by this means 1½ lb.

alcohol are sufficient for 5 lbs. naphthalin. (Laurent.)

Properties. Brilliant white scales, soft to the touch. Crystallizes in six-sided tables. (Kidd, Chamberlain.) — More frequently in rhombic tables of $100^{\circ} - 105^{\circ}$ (Kidd). Regular crystals may be obtained but only with great difficulty, by sublimation or from alcohol; they are rhombic tables of about 122° and 78° , the acute angles being generally truncated, so that the crystals appear hexagonal. By very slow spontaneous evaporation from ether, it may be obtained in crystals which are often of considerable size and completely developed; they are prisms belonging to the oblique prismatic system, generally like Fig. 106, but reduced to the tabular form by the predominance of the i-faces. $u': u' = 82^{\circ}: u': i = 111^{\circ}; u': t = 125^{\circ}; i: t = 94^{\circ}30'$. (Laurent.) — Crystallizes from oil of turpentine in prisms terminated by pyramids. (Chamberlain.) Naphthalin when slowly sublimed, forms such an extremely light bulky mass, that sometimes $\frac{1}{2}$ gramme will fill a litre-flask. (Handwörterb, 5, 432.) — Heavier than water (Kidd). Sp. gr. 1.048 (Ure); 1-153 at 18° (the naphthalin had been fused, but was still somewhat porous: — Reichenbach) Melts at 84° 5' (Garden), between 77° and 82° (Kidd), at 75.5° (Ure), forming an oil which on cooling solidifies in a mass consisting of flexible interlaced laminæ; melts at 79° (Dumas), at 79.2° (H. Kopp). — (The naphthalin used by Kopp for his determination was absolutely pure; when it was melted and allowed to solidify slowly, the thermometer remained constant at 79.2°.)

Sp. gr. of liquid naphthalin at its melting-point (water at 0° C. being taken as unity) = 0.9778 (average). The true volume at 8° above the melting point is given by the formula:

$$V = 1 + 0.000747 \times 8 + 0.0000018095 \times 8^2$$

Spec. vol. = 149.2 at the boiling point (calculated, according to Kopp = 154) (H. Kopp). Boils at 210° (Kidd), at 212° (Dumas), at 220° (Gerhardt); boils constantly between 216.4° and 216.8° (barometer at 0.0m 7476), or at 218.0° (barometer at 760mm) (H. Kopp). (Determined by Kopp's method, and rectified according to the corrections proposed by him.) Sublimes even at a low temperature (Garden), but more slowly than common camphor; heated alone, it sublimes in brilliant flakes (Ure), without previous fusion. (Laurent.) Thrown into a red-hot crucible, it volatilises undecomposed, and condenses in the air in snowy spangles, (Laurent.) May be distilled with water (Ure, Chamberlain); when heated with water, it rises to the surface in oily drops, and then evaporates with a motion similar to that exhibited by common camphor. (Ure.)

Smells aromatic, like the narcissus, (Garden and others.) Tastes aromatic and pungent. (Garden.) Neutral to vegetable colours. (Kidd.) Vapour-density = 4.528 (Dumas), 4.621 (average, Woskressensky, Ann. Pharm. 26, 66), 4.46 (Natanson, Ann. Pharm. 93, 801). Consequently, 1 litre of vapour weighs 5.882 grammes (Dumas), 5.939 grammes (Woskressensky).

	Faraday.	Oppermann.	
20 C 120 93-75 93-75 8 H 8 6-25 6-25	7773	94-39	0.34
C ²⁰ H ⁵ 128 100·00 100·00	100.000	100.00	100-10
Dumas. Mitscherlich. Work sens	ky. Marchan	d. Erdmann & Marchand.	Dumas & Stass.
20 C 94·2 94·39 94·4 8·H 6·5 6·21 6·0		93.58	93.83
C20H8 100·7 100·60 100·4	8 100.00	99.85	100-13
C-vapour	20	Density. 8:3200 0:5544	
Naphthalin-vapour	1	8·8744 4·4372	

The composition as stated by Faraday has been proved to be correct. Thomson regarded C³H², Ure C²H as more probable. According to Woskressensky's analysis, the formula is C³H (with which, however, his determination of the vapour-density does not agree: Gm.), in which case, naphthalin would be isomerie or polymeric with idrialin, and probably also with paranaphthalin, scheererite, and pyrene. The analyses made in Liebig's laboratory, gave as the average, 94 4 p. c. C, and 6·15 p. c. H, from which we get C⁵H³, after making the correction for hydrogen. (Liebig, 1838; Ann. Pharm. 25, 19.) — Faraday supposed the atomic weight of naphthalin to be C²⁰H³, (which has since been found to be the only admissible formula); Berzelius supposed it to be C²⁰H³; the last supposition was once made by Laurent (Ann. Chim. Phys. 61, 124).—According to Marignac, naphthalin may be regarded as a compound of two hydrocarbons:

C20H8 = C16H4 + C4H4,

for the following reasons: s. The formation of chlorine-compounds which are very analogous to those formed from olefant gas (the chlorine removing only half

the hydrogen from the naphthalin?); b. The resolution of naphthalin into compounds of the two hydrocarbons in the formation of nitrophthalic acid, Cl6XH5O8 and of phthalic acid, together with the compound ClX2Cl2 (ii, 360). According to Kolbe, it is hydride of naphthyl = Cl20H7, H (comp. Ann. Pharm. 76, 39.)

Decompositions. Naphthalin yields by sublimation a liquid which at first tastes Sweet and aromatic, afterwards pungent, and from which a considerable quantity of prussic acid may be obtained; Chamberlain.) 1. When naphthalin is heated in the air, the vapour is difficult to set on fire; when once ignited, it burns very rapidly with a thick smoke. (Kidd.)—2. Naphthalin vapour, passed over red-hot hydrate of baryta, yields carbonate of baryta and hydrogen.—(Pelouze and Millon, Ann. Pharm. 33, 182.)—3. Chlorine forms new compounds with naphthalin, heat being evolved and hydrochloric acid gas produced. (Laurent, Ann. Chim. Phys. 49, 214.)

The naphthalin melts, but solidifies again if the action of chlorine be continued; the solid mass contained 44:69 n.c. C. 3:12 n.c. H. and 52:19 n.c. be continued; the solid mass contained 44.69 p. c. C, 3.12 p. c. H, and 52.19 p. c. Cl. corresponding to the formula C10Cl4H4 (Dumas). Dry chlorine acts immediately and with great violence at ordinary temperatures. The naphthalin melts, and if the stream of chlorine be rapid, sublimes in part as bihydrochlorate of bichloro-naphthalin, while hydrochloric acid is evolved. The mass gradually thickens, and becomes like solidified olive oil. The products formed in this reaction are hydrochlorate of chloronaphthalin, C²⁰ClH²,HCl, and bihydrochlorate of bichloronaphthalin, C²⁰Cl²H⁶,2HCl (modification a and β); by the further action of chlorine and heat, new chlorides are formed from the first, with fresh evolution of hydrochloric acid gas, especially bihydrochlorate of trichloronaphthalin, C20Cl3H6,2HCl. (Laurent.) Chlorine replaces the hydrogen of naphthalin, atom for atom, but the resulting hydrochloric acid remains in combination with the new but the resulting hydrochloric acid remains in combination with the new radical (comp. also vii. 21). The chlorine which these compounds contain, outside the radical, may be removed in the form of hydrochloric acid, either by distillation or by treatment with potash, while the chlorinated radicals thus set free cannot be further decomposed by distillation or by treatment with potash. (Laurent.) If these radicals are again treated with chlorine, the hydrochlorates of new radicals, richer in chlorine are formed, which, in their turn, may be set free by distillation or treatment with potash, and are finally converted by chlorine into perchloronaphthalin. (Laurent.) The number of the chlorine-compounds obtained by Laurent is very much increased by the fact that almost all of them vary in physical properties when prepared in different ways. of them vary in physical properties when prepared in different ways. (This seems to be frequently caused by impurities.) (Carius.) Besides such radicals and their hydrochlorates as only contain whole atoms of Cl and H to 20 At. C, others are described by Laurent, containing a fractional number of Cl and H atoms, as well as Br and H, or ClBr and H together; the whole of these are probably mixtures of two or more compounds. (Carius.) Several of these radicals, and likewise their hydrochlorates, bear a great resemblance to one another; thus bihydrochlorate of bichloronaphthalin and bihydrochlorate of trichloronaphthalin (the latter recrystallised from alcohol) are isomorphous. (Laurent.) Laurent distinguishes the isomeric compounds of like composition by the letters A, B, &c., and even compounds of different composition, when agreeing in certain properties, e. g., crystalline form, are denoted by the same letters. Thus all radicals marked A are soft, like wax, and crystallise in regular six-sided prisms of 120°. (Laurent, Rev. Scient. 14, 74.)

4. Bromine acts violently upon naphthalin, with rise of temperature and evolution of hydrobromic acid, leaving oily bromo-

naphthalin. From this it appears that the bromine replaces the hydrogen, while the free radical is formed with evolution of hydrobromic acid. (Laurent.) By the further action of bromine upon bromonaphthalin, hydrobromic acid and bi- or tri-bromonaphthalin are formed, and from the latter, the hydro-bromates C²⁰Br⁴H⁴,2HBr, and C²⁰Br⁴H⁴,HBr (from which the radical C²⁰Br⁴H⁴ may be separated by distillation or by potash), and as the final product of the action of bromine, bihydrobromate of pentabromonaph-thalin is formed — C²⁰Br⁸H³,2HBr. (Laurent.) The bromine-compounds generally bear a great resemblance to one another and to the chlorine-compounds. compounds, e. g., isomorphism, and like these last, occur in different isomeric modifications (Laurent.) The chlorine-compounds which still contain hydrogen, are converted by bromine into radicals containing both bromine and chlorine, or into their hydrochlorates and hydrobromates. On the other hand, by the action of chlorine on the bromine compounds, the hydrochlorates of radicals containing bromine (or bromine and chlorine) are obtained; but the latter, as well as the radicals which may be separated from them, are not identical with those obtained by the action of bromine on the chlorine-compounds, but isomeric, and generally isomorphous with them at the same time. (Laurent.) — 5. Naphthalin melts with iodine at a gentle heat to a brown liquid, which solidifies to a graphitoïdal mass on cooling, dissolves readily in alcohol, and is precipitated therefrom by water. (Ure.) Iodine is without action upon naphthalin; on warming them together, they melt, but separate on cooling. (Laurent.) Phosphorus, sulphur, and chloride of carbon are equally inert with naphthalin. (Laurent.) 6. Hydrochloric acid does equally inert with naphthalin. (Laurent.) 6. Hydrochloric acid does not act on naphthalin (Reichenbach); it dissolves naphthalin, and assumes a dark colour. (Löwig. Chemie der. org. Verb. 2nd. pt. 2, 865.)—7. Chloride of Sulphur (which?) heated with naphthalin, produces bichloronaphthalin, with separation of plastic sulphur and evolution of hydrochloric acid gas. (Laurent.)—8. Cyanogen does not act upon naphthalin. If chlorine gas be passed over a powdered mixture of naphthalin and cyanide of mercury made into a paste with weak alcohol, an odour of chloride of cyanogen is evolved, mercurous chloride is formed, and the naphthalin is replaced by a yellow oil which is partly dissolved and may be precipitated by water. (Laurent.)—9. A mixture of bichroand the naphthalin is replaced by a yellow oil which is party dissorted and may be precipitated by water. (Laurent.)—9. A mixture of bichromate of potash and sulphuric (or hydrochloric) acid, acts but slightly on naphthalin, if much water is present; but if the quantity of water be small, a violent action takes place, and the naphthalin is partly converted into naphthesic acid (C²⁰H^cO⁵). (Laurent, Rev. scient. 14, 560).—According to another statement of Laurent (Comp. rend. 21, 36), a beautiful rose-coloured substance is formed in the above manner, viz., Carminaphthone; C¹⁵H⁴O⁵, soluble in alkalis and represipitated by acids. and reprecipitated by acids.

10. Strong nitric acid does not act upon naphthalin in the cold (Laurent); it forms nitronaphthalin, in the course of 5 or 6 days, without evolution of red vapours. (Piria, N. Ann. Chim. Phys. 31, 217). On gently warming the liquid, a brown oil is formed, which afterwards dissolves; the liquid on cooling deposits yellow crystals (Garden), readily decomposible and inflammable. (Kidd.) Naphthalin evolves red vapours on boiling with nitric acid, and forms a mixture of nitronaphthalin and an oil, which floats on the liquid in the fluid form; hence 1 At. H in the naphthalin is replaced by 1 At. O, with formation of water, and the resulting compound then combined with the residue of the nitric acid:

C30H5 + NO3 = (C30H7O + NO3) + HO (Laurent).

On continuing the boiling with nitric acid, binitronaphthalin, CPX2H4

(and nitronaphthaleise C20X2.5H5.5) is produced. (Laurent.) By boiling with nitric acid for several days, ternitronaphthalin, C20X3H3, nitronaphthale, phthalic and oxalic acids (Laurent), and nitrophthalic acid
(Marignac, Laurent) are formed.

11. Nitrous acid acts violently in the cold and forms nitronaphthalin

and an oil. - 12. Aqua regia acts slowly in the cold; in this reaction, an oil is formed, which by distillation leaves a residue of carbon, and yields

a distillate of nitronaphthalin and an oil.

13. Oil of vitriol dissolves naphtbalin very slowly in the cold, forming a brown liquid (Reichenbach); at a moderate heat, sulphonaphthalic acid is formed, and another acid, which is distinguished from the first by the fact that its salts do not burn with flame. (Faraday.) Oil of vitriol, when gently warmed, dissolves naphthalin without evolution of sulphurous acid, and forms a brownish red liquid, which, after complete saturation with naphthalin, is clear and viscid when cold. Water precipitates from the solution unaltered naphthalin, together with sulphonaphthalin and a little sulphonaphthalide, while the solution contains sulphonaphthalic acid, C²⁰H⁸, 2SO³, and bisulphonaphthalic acid, C²⁰H⁸, 4SO³ and acquires a red colour. (Berrelius.) C20H8,4SO3, and acquires a red colour. (Berzelius.)

With sulphuric anhydride, naphthalin melts to a dark red mass, which turns blackish-green, and contains principally sulphonaphthalic acid (Liebig and Wöhler); in this reaction, sulphurous acid is always evolved, even when naphthalin is placed with sulphuric anhydride under a bell-jar; the products are the same as those obtained by the action of sulphuric acid; only the colouring matter, bisulphonaphthalic acid, and sulphonaphthalide are formed in larger quantity, and hyposulphoglutic acid is likewise obtained. (Berzelius.)

Warmed with phosphoric anhydride, naphthalin volatilizes unchanged

(Laurent); it is not attacked by concentrated acetic or oxalic acid; or

by caustic potash-solution even on boiling (Reichenbach); or by fused potassium (Laurent).

14. When equal parts of naphthalin and fat are exposed to the air for a week, the mixture absorbs oxygen, which, together with part of the oxygen of the fat, is taken up by the naphthalin, giving rise to naphtholeic acid and a hydrocarbon; at the same time, a little carbonic acid is evolved and the mixture turns black. Naphtholeic acid, extracted from the mixture by ether, is a semi-fluid body becoming fluid at 20° C., yellowish, and transparent, and smells like crude naphthalin; it contains 65.65 p. c. C, 14.22 H, and 20.13 O, and forms soaps with the alkalis, uncrystallisable salts with baryta, strontia, lime, lead, copper, and silver; and decomposes partly at 75°, evolving strong suffocating vapours. (Rossignon.) It is rancid fat. (Gm.) — The hydrocarbon remains in the residue when the mixture is extracted with ether, and is purified by washing with ether, pressing between blotting paper, and crystallising from boiling alcohol. Forms thick silky flakes, soft to the touch, softening between the fingers, its consistence varying according to the nature of the fat; contains C and H in the proportion of 2:2.5 (has not been analysed!) (Rossignon, Compt. rend. 14, 61.) — It is impure naphthalin. (Gmelin.)

Combinations. 1. Naphthalin does not dissolve in cold water, or in aqueous alcohol. (Garden.) It dissolves slightly in boiling water; the solution deposits most of the naphthalin on cooling, but remains turbid, and in that state passes through the filter. (Kidd.) - 2. Dissolves very

tapeles a somirquite of earlier. Lecturation. — E. Minutes in Acres superally a ur mento, and a presumant from the solution " wary framen. Inchemiser the author it 4 ms. hit alcohol the green. That - a in the r discover man in 11 per yields the green. That - a in the r discover man would, (Kild, and very mindy because in 12 location in aqueous main and socie that will report will minute the warm-materialed contien winding n a grandine mass in mainty Garden, Kidl) income n our will for that y date former. In all y important, the emperature falling \$2" and make former. In all y important, the emperature falling \$2" and me and summand in monthly in the fact of the emperature for the income and in the fact of the emperature of the emperatur

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Will Fore 2016.—— I mixture if manifestin and portic seid at the product is very mixture in hemsens. The gradest yellow mortes vines especial in mining are wanted with a limbe abouted, positive proposed very west incoming under, and direct by expensive to the air.
? The compound is prescribed in mind similar crystals than those operated upontaining to a when the continuation submitted in mind in passes with a manufacture of marketing that passes will be upon and it meaning are mixed.—Golden-vertice crystals, welling in hie in e closur tentuge-register Direct ung un nie wenne nime erweitig ? into capitalist. It is insertion t decimposed it cold water, which consider posts and sufficient from it lating water, part of the constraint passing off in regard; nevertheless increasing meeters of the compound see ourment from the Elegal schime. It violates all its pierio and is wern there squeeze ammonia. Dimeiros in alcohol, ether, and volume, especially in Endocumpused on evaporation. (Fritzele, Power, Ann., Irall, 14, 12); J. pr. (Lon. 72, 282.)

CHI + CEXTHEF	237		130-00	
I At poorse and CaXHPO	223	_	64-16	 61-10
At septemin CH	125	_	\$5-54	
				Prikanche.

Appendix to Naphthalin.

A. Metanaphthalin. CH.

Vallerien & Walten. (1837.) Ann. Chim. Phys. 67, 269; Popl. 44, 81. Disman. Compt. rend. 6, 460; Pogg. 44, 110; J. pr. Chem. 14, 214.

Holiserin, (l'elletier and Walter.)

Formulion. Found accompanying naphthalin in the tar formed when Illuminating gas is prepared by dropping melted pine-resin into red-hot iron cylinders; it probably exists also in many other empyreumatic products (l'elletier & Walter.)

Preparation. Resin is submitted to distillation; the buttery mass ag over towards the end is collected apart; all adhering liquid is d as completely as possible by pressure between blotting paper;

and the residue is dissolved in absolute alcohol. The solution, treated with animal charcoal at a temperature a little above 40° C., then filtered and allowed to cool, yields crystals of metanaphthalin, which may be purified by repeated recrystallisation. (Pelletier & Walter.)

Properties. White nacreous crystalline flakes, unctuous to the touch, having a feeble odour of wax but no taste. Melts at 67° C.; distils over at 325° as an oil, which solidifies in a crystalline mass on cooling. Unaffected by light and air. (Pelletier & Walter.)

				Pelletier Walter	Dumas.
20 C 8 H	120 8		93·75 6·25		 mean. 93·4 7·0
C20H8	128	****	100.00	 100.44	 100.4

According to Dumas, the formula is perhaps C32H14, which requires 93.2 p. c. C and 6.8 p. c. H.

Decompositions. 1. Metanaphthalin is not acted upon by aqueous chlorine, but if chlorine gas be passed into the melted substance, it is converted, with evolution of hydrochloric acid gas, into a green resin, which is not crystallisable, and is still less soluble in absolute alcohol than metanaphthalin. (Pelletier & Walter.) — 2. Cold nitric acid acts but slightly upon metanaphthalin; heated acid converts it into an ochreyellow resin which decomposes by heat, without volatilising. (This distinguishes it from naphthalin.) (Pelletier and Walter.) 3. Oil of vitriol does not act in the cold or on gently warming; but if metanaphthalin be boiled with a large excess of oil of vitriol, it becomes carbonized. No sulphometanaphthalic acid appears to be formed in this reaction. (Pelletier & Walter.)

Combinations. Insoluble in water. - Dissolves sulphur by heat. (Pelletier & Walter.) - Metanaphthalin is not attacked by potassium or by other metals; neither does it combine with the alkalis. - Dissolves slightly in cold, and very abundantly in hot alcohol, crystallising there-from on cooling; it is still more soluble in ether (paranaphthaliu is insoluble in ether), and most soluble in rock-oil, oil of turpentine, and other hydrocarbons. (Pelletier & Walter.)

B. Bodies isomeric with Naphthalin, and obtained by the dry distillation of the Benzoates.

LAURENT & CHANCEL. Compt. chim. 1849, 117; J. pr. Chem. 46, 510; Liebig & Kopp's Jahresb. 1849, 326.

CHANCEL. Compt. chim. 1849, 87; Compt. rend. 28, 83; Instit. 1849, 19; Ann. Pharm. 72, 279; Pharm. Centr. 1849, 216; Liebig & Kopp's Jahresb. 1849, 326; Further, Compt. chim. 1851, 85; Ann. Pharm. 80, 285; J. pr. Chem. 53, 252; Liebig & Kopp's Jahresb.

LIST & LIMPRICHT. Ann. Pharm. 90, 209.

a. Hydrocarbon C20H8, melting at 92°.

Formation. Formed together with 5. in the preparation of benzone (xii, 40), by the dry distillation of benzoate of lime; on rectifying the crude liquid, a and b are obtained in the portion which passes over up to 315° C, before the benzone.—a, and b are doubtless secondary products formed by the decomposition of benzone (Chancel.)

Preparation. The various products from the dry distillation of benzoate of lime are dissolved in oil of vitriol, whereupon the hydrocarbon a rises almost instantly to the surface of the liquid. This substance is removed, washed with water, repeatedly pressed between blotting paper, and recrystallised once or twice from boiling alcohol. (Chancel.)

Properties. Crystallises readily in fine needles, melts at 92°, and volatilizes at a high temperature only (Chancel).

			3-1	1-12		
20 C 8 H					93·46 6·49	
C20H8	128	ini	100-00		99-95	

From the high boiling point of a (and δ), Chancel concludes that the atomic weight of a (and of δ as well) must be very high; perhaps $C^{20}H^{3}$ or $C^{20}H^{12}$.

Dissolves more readily in alcohol and in ether, than b. (Chancel.)

b. Hydrocarbon CooHe, melting at 65°.

Formation. (Comp. p. 11.) 2. By passing the vapour of benzoate of ammonia over red-hot baryta, much benzonitrile, C14NH3 (xii, 161) being at the same time produced. (Laurent & Chancel.)—3. By the dry distillation of benzoate of potash. (Chancel).—4. When benzoate of copper is submitted to dry distillation (see xii, 43), the products there mentioned are obtained, together with an oil boiling at 260° which, by heating with oil of vitriol, is resolved into sulpho-carbolic acid and crystals, the latter separating out as the sulphuric acid solution cools, and more completely by the addition of water. These crystals appear to be identical with Chancel's hydrocarbon b. (List & Limpricht.)

Preparation. 1. The following is the best method. When benzoate of lime is mixed with potash-lime, and submitted to dry distillation, a solution of b in benzene is obtained. The solvent is removed by distillation in a water bath, and the residue is purified by crystallisation from alcohol (Chancel). — The vapour of benzoate of ammonia is passed through a tube containing red-bot baryta, and the small quantity of crystals obtained together with benzonitrile, is purified by sublimation and crystallisation from alcohol. (Laurent & Chancel.)

Properties. Colourless (nacreous, iridescent (List & Limpricht) laminum, crystallising with difficulty, and melting at 65° (69° according to List & Limpricht). Volatilises without decomposition at a very high superature. (Laurent & Chancel). Has a faint agreeable smell of roses.

						C	hancel.	Limpricht.
20 C 8 H	120	****	93·75 6·25	*******	93·54 6·47		93·9 6·4	 93·41 6·66
C20H8	128	****	100.00	********	100-01		100.3	 100.07

According to Gerhardt (Traité 3, 984) the body is perhaps C24H10 phenyl (by calculation, 93.5 p. c. C, 6.5 p. c. H).

Forms a crystallisable substance with bromine (this distinguishes it from naphthalin). (Chancel.)

It is far less soluble in alcohol and in ether than a. (Chancel.)

Conjugated compounds of the nucleus C20H8.

Sulphonaphthalic Acid.

 $C^{20}H^8S^2O^6 = C^{20}H^8,2SO^3.$

FARADAY. Phil. Trans. 1826, 140; Schw. 47, 355 and 459; Extr. Pogg. 7, 104.

Berzelius. Pogg. 44, 377; Ann. Pharm. 28, 9; abstr. Berz. Jahresb. 18, 468.

REGNAULT. Ann. Chim. Phys. 65, 87; J. pr. Chem. 12, 99.

Liebio & Wöhler. Pogg. 24, 169.

GREGORY. Ann. Pharm. 22, 272.

Wöhler. Ann. Pharm. 37, 197.

LAURENT. Compt. rend. 21, 33; Compt. chim. 1849, 390; Extr. Ann. Pharm. 72, 297.

Sulphonaphthalic acid (Faraday); Hyposulphonaphthalic acid (Berzelius); Sulphonaphthanic acid (Laurent); Dithiononaphthylic acid (Kolbe). — First prepared and investigated by Faraday.

Formation. Produced by melting naphthalin with oil of vitriol (Faraday), or with sulphuric anhydride (Liebig & Wöhler), or with Nordhausen sulphuric acid, — bisulphonaphthalic acid, sulphonaphthalin, sulphonaphthalides, and a red colouring matter, being in all cases simultaneously formed. (Berzelius.) — The last four products are obtained in larger quantity, when Nordhausen sulphuric acid or sulphuric anhydride is employed (in which case hyposulphoglutic acid is formed, and sulphurous acid is always evolved), the proportion increasing with the violence of the reaction. (Berzelius). — When oil of vitriol is employed, a particular acid is likewise formed, yielding with baryta, Faraday's smouldering baryta-salt. (Faraday.) Regnault did not obtain this salt, but Berzelius produced it in small quantity. — If an excess of sulphuric anhydride is employed, no undecomposed naphthalin is left. (Liebig & Wöhler.) If oil of vitriol is used, the whole of the sulphuric acid does not pass into combination, even when the naphthalin is in excess and the mixture is warmed for several hours (Faraday); on the contrary, when 14 atoms of boiled oil of vitriol are digested at 100° C, for 12 hours, with an excess of naphthalin, 5 At. of sulphonaphthalic acid at the most are formed, and there remain 4 At. of 3½-hydrated sulphuric acid, which is no longer capable of forming sulphonaphthalic acid. Bi- and even terhydrated sulphuric acid still form a certain quantity of sulphonaphthalic acid. (Regnault.)

Preparation. A. Free acid. 1. The thick liquid which is obtained by saturating the most highly concentrated oil of vitriol at 90° with

terroreals and the first allies when ever from the air is allowed to account to the first the same when a is recipied by directly a ring the tiest doubt with a line water. Then the schilded man has seen as in a possible freet from affecting substitute and by spreading a soon a local possible freet from affecting substitute and by spreading a soon a possible the soil them by present between two other tiles, a read a man of the tiles, a read and the tile specially state and the tiles and the second substitute and the subst

I happenent to Wei fell of Verial I. Seven hundred pts. If companies to the method with 150 pts. It of verials and the whole consists appeared. After the mass has become such the cake of crystals a covariate from the negligible health in and melted with 300 pts. more of coppense at the covariate and appeared liquid is obtained, which separates the covariate that where the lower stratum is warmed and shaken with § of its on the negligible with the liquid is diluted with more where all neutralized with carbonate of baryta, whereupon the negligible was the promptate elightly washed. The promptate contains, besides the contain and suggest of baryta, sensibleing baryta sat, which may be a company and suggest of baryta. (Farniay's smoothering baryta sat, which may be a company and suggest of baryta. (Farniay)

2. Naphthalin is digested with 2 pts. oil of vitriol between 70° and 200 for several hours, and the resulting dark-red solution is diluted with mater, neutralized with carbonate of baryta, filtered hot, and crystallised by seeing. The mother-liquor yields more crystals on evaporation, and the residues on the filter when boiled with water, likewise yield a little more of the same salt. The baryta-salt is purified by recrystallisation. (Regnault.)

3 The best method. Naphthalin, freed from water by melting at 100°, is added in small pertions to oil of vitriol which has been distilled and perfectly dried by prolonged heating, and the whole heated in a water bath to 100° C. (90° Wöhler), whereupon the naphthalin melts, and dissolven, without evolution of gas, forming a yellowish red solution Naphthalin is continually added till the liquid, after being warmed for half an hour, deposits undecomposed naphthalin when diluted with water; facther addition is superfluous. The liquid, which when cool is homogeneous, red and viacid, in diluted, and the naphthalin, part of which is deposited immediately and the rest in the form of scales on cooling, is separated by filtration. The residue on the filter partly dissolves in the wash-water (the soluble partion appears to consist of naphthalin together with sulphonaphthalic acid,) The bright brown yellow filtrate contains sulphonaphthalic acid, bisulphonaphthalic acid, free sulphuric acid and a red colouring matter. To purify the first two and to separate them from one another, either of allowing methods may be adopted. (a.) The impure acids are

saturated with carbonate of baryta; the baryta is precipitated from the filtrate by sulphuric acid, whereupon the red colouring matter is likewise precipitated; and the now colourless filtrate is again saturated with carbonate of baryta, filtered, concentrated by evaporation, and mixed with twice its volume of alcohol, whereupon the mixture becomes turbid, and deposits for several hours a pulverulent precipitate of bisulphonaphthalic acid. The greatest part of the alcohol is then distilled off from the residual solution, which on cooling deposits part of the suphonaphthalate in brilliant scales. On evaporating down the mother-liquor and adding alcohol, a fresh portion of the nearly insoluble bisulphonaphthalin is deposited; and the filtrate, which when treated with acetate of lead gives only a slight precipitate after long standing, deposits sulphonaphthalate of baryta in scales. — (b.) The impure acids are completely freed from sulphuric acid by carbonate of baryta, and the solution only half neutralized with carbonate of baryta, whereupon the liquid solidifies in a thick mass of small scaly crystals. In this manner, only the stronger sulphonaphthalic acid is neutralized of which the baryta-salt being, almost insoluble in the cold acid liquid, is separated; but if the whole were completely neutralized or merely warmed, the precipitate would redissolve. The salt is collected on a filter, washed with cold water, and dissolved to saturation in boiling water, from which it crystallises in scales on cooling. In this way, pure sulphonaphthalate of baryta is obtained (the concentrated solution of which is not precipitated by alcohol, and only after several days by acetate of lead), bisulphonaphthalic acid remaining in solution. (Berzelius.)

b. With Sulphuric Anhydride. The vapour of sulphuric anhydride

b. With Sulphuric Anhydride. The vapour of sulphuric anhydride is passed into a receiver, wherein naphthalin is kept in fusion. The mass, which at first turns red, and afterwards dark brown, is dissolved in boiling water, and the naphthalin, which partly solidifies on the surface, and partly crystallises out on cooling, is separated by filtration. The sulphonaphthalic and bisulphonaphthalic acids thus obtained, are purified

and separated by methods a or b.

Properties. Known only as a bihydrated acid. — White, solid mass, hard and brittle when completely dry. (Faraday.) Solidifies in an irregular crystalline mass when the aqueous or alcoholic solution is evaporated (Regnault). Melts below 100° without decomposition and solidifies in a crystalline mass on cooling (Faraday). Melts between 85° and 90° (Regnault). Tastes bitter, acid, and somewhat metallic, like copper salts.

_	-	,2SO ³ + 2Aq		****	14.17	-	-
				****	28.32		
10	•		10		4.43	*******	4.69
			120	****	53.08	*******	53.71
							Regnault in vacuo.

Sulphonaphthalic acid is a compound of unaltered naphthalin with sulphuric acid = C°H² + 2SO². (Faraday, Laurent.) Contains hyposulphuric acid, and is formed by the simple combination of naphthalin with sulphuric acid:

the 1 At. of water being replaceable by bases. (Regnault.) Contains hyposulphuric acid, as is rendered probable by the behaviour of the potash-salt when boiled with

potash, and of the mixture when evaporated to dryness and strongly heard. If the acid (according to Regnault) = C²⁰H7SO⁵,HO, the buryts salt should give on analysis 22.61 p. c. water; Regnault obtained 23.73, Berzelius 24.65 p. c. (average) of water; hence the formula of the acid = C²⁰H⁶S²O⁵,HO. The formation of sulphomophthalic acid by the action of sulphuric acid upon naphthalic, is not so simple as Regnault supposes, since other products are always formed as well as this acid. — The acid may also be viewed as a compound of 1 At. sulphonophthalin with 1 At. sulphuric acid. (Berzelius.)

Decompositions. Melts between 85° and 90°, evolving part of its water of crystallisation, but decomposes before all the water has been driven off; at about 120° C, it begins to smell of naphthalin; at a higher temperature, it swells up and leaves a very brittle shining residue of carbon (Regnault). At a gentle heat, sulphonaphthalic acid turns red, without evolution of sulphurous acid, gives off a little water, and then contains free sulphuric acid; if a stronger heat be applied, it evolves a little naphthalin, and assumes a dark brown colour, carbonization then suddenly setting in from the bottom of the vessel, and spreading rapidly through the entire mass; at a still greater heat, naphthalin, sulphurous acid, and charcoal are obtained; but even after ignition, the residue still contains a little sulphonaphthalic acid. (Faraday.)

If the concentrated aqueous solution be warmed, it first turns yellow, then brown, and is found to contain a yellow colouring matter, which also passes into most of the salts; it can only be separated from the baryta-salt, by adding a few drops of sulphuric acid, and afterwards treating the solution with a little oxide of lead. (Bernelius.)

2. The aqueous acid placed in the circuit of the voltaic battery, gives off hydrogen at the negative pole, and oxygen and sulphuric at the positive pole; the sulphuric acid acting upon the naphthalin, produces a dark yellow colour. (Faraday.)

dark yellow colour. (Faraday.)
3. Nitric Acid converts it, first into nitro-sulphonaphthalic acid, and afterwards, by prolonged action, into binitrosulphonaphthalic acid.

(Laurent.)

4. The potash-salt, boiled for a long time with an excess of potash, yields neither naphthalin nor sulphuric acid, but crystallises out unchanged on cooling. If the mixed solution be evaporated to dryness and the residue of potash-salt and potash be heated till naphthalin begins to sublime, and the mass turns dark, its solution in water smells of creosote, a blackish brown residue remains undissolved, and the dark yellow solution gives with hydrochloric acid, a whitish precipitate of fine, slowly subsiding crystalline scales. More of this substance is extracted by alcohol from the residue; the solution acidified with hydrochloric acid, smells of sulphurous acid, and evolves that gas on boiling. (berzelius.)

5. The potash-salt, heated with sulphide of hydrogen and potassium, yields a very foul-smelling liquid which is soluble in water and does not

precipitate fead-salts (naphthalin-mercaptan) (Gregory).

Combinations., The acid deliquesces in the air, and is very soluble in water. (Faraday.)

Sulphonophthalates. The acid neutralises alkalis. The concentrated solution precipitates chloride of barium, but the precipitate dissolves on addition of water. The formula of the salts is C*H'MS'O*. Submitted to dry distillation, they yield first water and a little naphthalm then sulphurous and carbonic acids, and leave a residue of sulphate, sulphide, and charcoal. Heated in the sir, they burn with flame, and leave a

residue of sulphate mixed with charcoal. (Faraday.) They deflagrate violently with nitre; do not give off naphthalin when boiled with potash; decompose slowly when the dried residue is strongly heated, (Regnault.) They are all soluble in water, and mostly soluble in alcohol. (Faraday.)

Sulphonaphthalate of Ammonia. Ill-defined crystals having a cooling saline taste. Melts and blackens by heat, burns with flame, and leaves a residue of acid sulphate of ammonia mixed with charcoal. If the aqueous solution be evaporated at ordinary temperatures, even when containing an excess of ammonia, it acquires the property of reddening litmus. Readily soluble in water, but not deliquescent. (Faraday.)

Sulphonaphthalate of Potash. Obtained by decomposing the baryta salt with sulphate of potash. (Regnault.) Colourless, soft crystals, unctuous to the touch, sometimes transparent, sometimes opaque, occasionally forming efflorescences composed of small needles. (Faraday.) Small, white, very brilliant flakes, giving off in vacuo 3.78 p. c. aq. (1 At.=3.53 p. c.) (Regnault.) Permanent in the air; taste bitter and saline. (Faraday.)

	In	vacuo.				Regnault.
20 C	***************************************	120.0	****	48.73	********	48.98
7 H	***************************************	7.0	****	2.84	*******	3.04
ко		47.2		19.16	********	19.09
28	***************************************	32.0		12.99	********	13.24
50		40.0	****	16.28	******	15.65
C20H7E	,2SO ³	246.2		100.00	********	100.00

The salt burns with flame in the air, and leaves a residue of sulphate of potash having a very feeble alkaline reaction. (Faraday.) Dissolves readily in water; the colourless solution is not decomposed by repeated evaporation and crystallisation. Dissolves in alcohol, forming a colourless liquid. (Faraday.)

Soda-salt. — White nacreous crystals permanent in the air and having a peculiar and decided metallic taste. (Faraday.)

Sulphonaphthalate of Baryta. (Burning with flame, Faraday.) Preparation (comp. p. 14.) Crystallises in tufts when the aqueous solution is slowly evaporated (Faraday), in cruciform laminæ resembling prehnite (Regnault). Deposited in grains on cooling the hot aqueous solution (Faraday). Crystallises in foliated masses from the hot solution (Regnault). Crystallises from boiling alcohol in large transparent scales, which, on drying, cohere in a mass having a silvery lustre. (Berzelius.) After drying it appears white and tender, soft to the touch. Tastes bitter. Permanent in the air. The salt dried in vacuo, as well as that dried in the air, still contains 1 at. water, and gives off at 100°, 3.485 p. c. water = 1 at. (Regnault.) Contains 1 at. of water of crystallisation, which is completely expelled at 50°. (Berzelius.)

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							Lichig S Wühler. at 190°.		Faraday.
20 C	120		43.55		43 -80		43-40	_	41-90
7 H	7	*	2-54	*********	2-66		2.86		2-86
BaO	76-5	•	27:76		27-59	••••	26.38		27-37
2 8	32		11-61		11:76				
5 O	40		14-54		14-19				
(3UID- 95(N	9:1:6		100-00		100-00				

Berzelius obtained on the average 41.83 p. c. sulphate of baryta from the salt dried at 100°.

Sulphonaphthalate of baryta, heated in a tube, evolves naphthalin, but not till the temperature exceeds 260° (a non-inflammable gas is evolved according to Regnault), then sulphurous acid and a little tarry matter, and at a very high temperature, leaves a blackish mixture of charcoal, sulphate of baryta, and sulphide of barium. (Faraday and Regnault.) — Heated on platinum foil, it burns with a brilliant, very smoky flame, and leaves the same blackish residue. — Not decomposed by boiling with moderately strong nitric or nitro-hydrochloric acid, so that no sulphate of baryta is precipitated from the solution; if, however, the acids are very concentrated, sulphuric acid is then liberated and other special decomposition-products are formed. (Faraday.) — Chlorine does not decompose the dry salt, unless heat is applied, whereupon the chlorine acts upon the naphthalin as it is liberated. — Soluble in alcohol, insoluble in ether.

Sulphonaphthalate of Strontia. — White, imperfectly crystalline substance, resembling the baryta-salt; it is permanent in the air. Burns with a brilliant, but not red flame, leaving a residue similar to that of the baryta-salt. Soluble in water and in alcohol. (Faraday.)

Suphonaphthalate of Line crystallises imperfectly and has a bitter taste. Heated in a tube, it yields the same products as the baryta-salt. Burns with flame. Dissolves slightly in water; soluble in alcohol. (Faraday.)

Sulphonaphthalate of Magnesia. — White, crystallisable salt, of moderately bitter taste. Behaves like the baryta-salt when heated in a tube; burns with flame. (Faraday.)

Sulphonaphthalate of Manganese is neutral, has an astringent taste, and gives the same results on heating as the baryta-salt. Dissolves in water and in alcohol. (Faraday.)

Sulphonaphthalate of Zinc. — Obtained by dissolving the metal (in which case hydrogen is evolved), or the hydrated exide, in sulphonaphthalic acid. White, bitter needles, permanent in the air, and burning with flame. Soluble in hot water. (Faraday.)

Sulphonophthalate of Lead is prepared by dissolving oxide of lead in reacid. (Regnault.)

a. Neutral. White salt, permanent in the air (Faraday); crystallises still more irregularly than the baryta-salt. (Regnault.) Exactly like the baryta-salt, but more soluble; crystallises by spontaneous evapora-tion in crystals which may be split into plates like mica. (Berzelius.) Tastes bitter, metallic, and slightly sweet.

					Regnault.
20 C	120	****	38.63	*******	38.50
7 H	7		2.26		2.40
PbO	111.7		35.93	*******	35.75
28	32	****	10.29	********	10.21
50	40	****	12.89		13.14
C20H7Pb,2SO3	310.7	600	100.00		100-00

Behaves like the other salts when heated. (Faraday.) Decomposes by heat with increase of volume, and forms ramifications in all directions.

(Regnault.)

Dissolves in water and in alcohol. (Faraday.) It is less soluble in water containing free acid, than in pure water; the warm-saturated solution solidifies on cooling in an interwoven mass of scales, (Berzelius.)

b. Basic. The neutral salt a is dissolved in water, and the solution boiled for some time with oxide of lead. The diluted solution on cooling deposits the new salt in crystalline flakes. Contains 53.81 p. c. oxide of of lead, which is expressed by the formula: C²⁰H⁷Pb,2SO³ + PbO. (Regnault).

c. When the solution of b is boiled for a considerable time longer with massicot, the decanted liquid deposits an abundant white powder, and scarcely anything remains in solution. (Regnault, Berzelius.) Regnault found 70°36 p. c. oxide of lead, corresponding to the formula, C²⁰H²Pb, 2SO³ + 3PbO.

Berzelius obtained a fourth basic salt of lead by prolonged boiling of the neutral salt with oxide of lead. A mass was deposited insoluble in water, soft and viscid when warmed, but becoming hard on cooling.

Ferrous Sulphonaphthalate is obtained by dissolving the metal (hydrogen being evolved), or the hydrated ferrous oxide in the acid. Crystallisable. The aqueous solution absorbs oxygen from the air. (Faraday.)

Sulphonaphthalate of Nickel. — a. Neutral. Formed by dissolving the carbonate of the base in the acid. Green crystals decomposible in the ordinary way by heat; soluble in water. (Faraday.)

b. Basic. Insoluble in water.

Sulphonaphthalate of Copper is prepared by dissolving hydrated oxide of copper in the acid. Laminæ united so as to present a radiated appearance; very pale green. Contains water of crystallisation, which it partly loses in dry air. Melts by heat, and burns with flame attended with the usual phenomena. (Faraday.)

Mercurous Sulphonaphthalate. — Formed by dissolving the freshly precipitated carbonate in the acid. White, slightly crystalline salt, having

a metallic taste and feebly acid reaction. Destroyed by heat. When dissolved in water or alcohol, it leaves a yellow basic salt. (Faraday.)

Mercuric Sulphonaphthalate. — The solution of the recently precipitated exide leaves on evaporation a yellow deliquescent residue. May be set on fire in the air. (Faraday.)

Bulphonaphthalate of Silver. — When the freshly precipitated hydrated oxide is dissolved in the acid, the almost neutral, brown solution, leaves on evaporation a brilliant, white, crystalline salt, permanent in the air, and having an intensely metallic taste. (Faraday.) Micaceous lamina soluble in 9.7 pts. water at 20° C. (Regnault.) Regnault found 36.03 p. c. AgO (calculation, C20H3Ag,2SO3 = 36.84 p. c. AgO). The aqueous solution deposits by prolonged boiling a black insoluble mass and then yields by evaporation abundant yellow crystals. (Faraday.) Does not decompose, even after several hours' boiling. (Regnault.) Burns with flame, leaving as final residue pure metallic silver.

Fulphonaphthalic acid dissolves in alcohol, slightly in ether. Dissolves in oil of turpentine, olive-oil, and melted naphthalin, and in greater proportion the more anhydrous it is. The solution in naphthalin forms on scaling two strata, the upper of which is a solution of the anhydrous acid, the lower a solution of the hydrated acid in naphthalin. (Faraday.)

Acid of Faraday's Smouldering Baryta-salt.

C20H8,2SO3 ?

FARADAY. Phil. Trans. 1826, 140; Schw. 47, 355 and 459; abstr. Pogg. 7, 104.
Bearenson. Pogg. 44, 377; Ann. Pharm. 28, 9.

Formation and Preparation. By acting on naphthalin with sulphuric most, Faraday obtained, besides sulphonaphthalic acid, a second acid, which, he says, is formed in proportionally smaller quantity, as the oil of vitriol is allowed to act upon the naphthalin at a lower temperature and in smaller quantity. The baryta-salt remains upon the filter, after the saturation of the impure sulphonaphthalic acid, together with the sulphate of baryta and a little sulphonaphthalate of baryta. The matter is extracted with boiling water, and the two baryta-salts are superated by crystallisation. (Faraday.) To obtain the acid, the leadant is decomposed with sulphuretted hydrogen, and the filtrate evaporated in vacuo over sulphuric acid. (Berzelius.)

Mass arystallising in scales, soft to the touch, tasting acid and bitter

like sulphonaphthalic acid.

these not absorb moisture from the air, but gradually turns yellowish-

tash salt crystallises in scales, readily soluble in alcohol. It imposed by boiling with concentrated potash-solution, but and unchanged on cooling.

Baryta-salt. -- Small, translucent prisms, grouped in tufts, perfectly neutral, and almost tasteless.

20.0	100		10.00		Faraday.
20 C	120	****	43.55	******	42.40
7 H	7	****	2.54	********	2.66
BaO	76.5	****	27.76		28.03
28	32		11.61	*******	
50	40	****	14.54		
C20H7Ba,2SO3	275.5		100.00		F

Since this salt is just as neutral as that of sulphonaphthalic acid, it appears to differ from the latter only by a slightly lower percentage of naphthalin. (Faraday.) The baryta-salt contains exactly as much baryta as the common sulphonaphthalate; hence it is probable that the acid contains hyposulphuric acid in combination with an isomeric modification of naphthalin. (Berzelius.)

The baryta-salt, heated in a tube, evolves only a little naphthalin together with a vapour having an empyreumatic odour, and a little sulphurous acid, and leaves the same residue as sulphonaphthalate of baryta. Heated on platinum foil, it gives only a slight flame, but rather smoulders away like tinder. The salt, heated for three hours to 227°, increases by only 0.8 per cent. of its weight in the air. Soluble in water, but much less than the sulphonaphthalate of baryta. (Faraday.)

Lead-salt. - Exactly like the baryta-salt. (Berzelius.)

Bisulphonaphthalic Acid.

 $C^{20}H^8S^4O^{12} = C^{20}H^8.4SO^3.$

Berzelius. Pogg. 44, 393; Ann. Pharm. 28, 9; abstr. Berz. Jahresb. 18, 468.

LAURENT. Compt. chim. 1845, 177; Compt. rend. 21, 33; Compt. chim. 1849, 390; abstr. Ann. Pharm. 72, 297; Liebig & Kopp's Jahresb. 1849, 440.

Hyposulphonaphthalic acid. (Berzelius.) Sulphonaphthalic acid, Thionaphthalic acid, Thionaphthyl-Dithionschwefelsäure. (Kolbe.) Disulfonaphtalinsäure.

Formation. Comp. p. 14. (Sulphonaphthalic acid.)

Preparation. The bisulphonaphthalate of baryta precipitated by alcohol in the preparation of sulphonaphthalate of baryta (p. 14, 3, a), is washed with alcohol, dried, and dissolved in boiling water, whereby a yellow solution is generally formed. In order to get rid of the colour, part of the baryta is precipitated with sulphuric acid; the acid solution is saturated with carbonate of lead and filtered; the oxide of lead reprecipitated by baryta, and filtered; and the liquid free from oxide of lead, is slightly acidified with dilute sulphuric acid, then filtered, and evaporated down, whereupon the baryta-salt crystallises. The crystals are washed with alcohol till the liquid ceases to redden litmus. The acid

notices appear evaporated among to review manifolds in which are washed to and their values with free among Penis a finite parties of the same and the same transfer of the former and a removal by maximum of the finite and the least of evaporated and the same in evaporated by subminimized by the former is free evaporated in a value was supported by reperturbed by report a critical of and them in value was supported and. The posterior and the transfer of and them in the supported and the evaporated of evaporation and the supported and a sum theory which has a spirit property makes. Because

It the east form a supplementationly and field will like powdered to the transported and other transported in an analysis of the experimental problems of the experimental problems of the experimental problems.

Bee for months now. Evaluational plaints and is follows. In sales of College of a second of Experimental they are College MONO. They recently the appropriate and have the same bitter take. They are not to a very tight emperature at becompass them, and then you to a terminal and then you to appropriate parable, but if the mixture is evaluational down till the second of the college with subplants and, employed a proper ask of these sales are readly solvide in water. To account a water of a mail quantity of one of these sales is mixed with a component and the research of lead are added to the solution, whereupon a group take a formed, camplicinal challenge of lead being almost insoluble to account these sales as formed, the applicant challenge of lead being almost insoluble to account the second of second of second of lead are added to the solution, whereupon a group take a formed, the applicant challenge of lead being almost insoluble to account the second of second of second of lead are added to the solution.

Been placed in order of Australia exactly resembles the potash-salt; compared at a gettle heat, it becomes coloured, and the residue contains free sect.

Built inophical are of I study is obtained by spontaneous evaporation, as a waite granular mass; crystallises from a warm solution of equeues potash, in scales united in arborescent groups. Readily soluble in water, elightly soluble in alcohol.

Bisulphonaphthalate of Sola does not afford good crystals by spontaneous evaporation; it is more soluble in alcohol than the potash-salt.

Bisulphonaphtholate of Baryta is deposited, by evaporation of the solution on a water-bath, in crystalline crusts on the bottom of the ver-el and on the surface of the liquid. If the hot solution be allowed to cool surely, the liquid becomes filled with a non-crystalline woolly vegetation of the salt.—Snow-white substance, resembling chalk.

The anhydrous salt, exposed to heat, yields a sublimate of naphthalin, but not till charring has commenced, and gives acid vapours think however do not smell of sulphurous acid. Dissolves very slowly in water, even at the boiling heat. The solution may be evaporated down to considerable extent before yielding any deposit; it generally turns policy on evaporation, but, when containing free acid, deposits a white sait, if however, it is neutral, it deposits a coloured salt, which leaves much brown residue when dissolved in water.

Very slightly soluble in alcohol, and precipitated from the aqueous solution by alcohol.

					Berzelius. at 100°.
20 C	120		28:37	******	29.24
6 H	6	****	1.42	******	1.78
2 BaO,SO3	233		55.08		50.93
2 809	64	****	15:13		
C20H6Ba2,4SO3	423		100.00		

According to Berzelius, the formula is C¹¹H^{4,5}O,BaO,S²O⁵ (calculation requires 51-13 p. c. BaO,SO⁵), comp. p. 22. The discrepancy between his analysis and the formula assigned, cannot easily be accounted for.

Bisulphonaphthalate of Lead is exactly like the baryta-salt. It dissolves in water, but is so little soluble in alcohol, that it is almost completely precipitated thereby from its aqueous solution. (Berzelius.) Parts with 7 p. c. water at 220° C. (4 At. = 6.82 p. c.), and then

contains 60.6 p. c. PbO,SO3 (calculated, 61.5 p. c.). (Laurent.)

20 C 10 H 2 H 2 S 8 C	bO,SO ³	120 10 303-6 32 64	****	22.65 1.89 57.33 6.04 12.09	 at 100°. 23.00 1.67
ConH	10Pb2,4SO3, + 4Aq	529.6	-	100.00	

Hyposulphoglutic Acid.

BERZELIUS. Pogg. 44, 377; Ann. Pharm. 28, 9.

Preparation. 1. When the red sulphate of baryta, obtained in the preparation of sulphonaphthalic acid (p. 14), is boiled for a long time with an excess of carbonate of soda, hyposulphoglutic acid, is extracted together with a red colouring matter and a resin. The liquid, at a certain degree of concentration, deposits impure hyposulphoglutate of soda, in brown, viscid, glutinous masses, which however redissolve on dilution. The liquid filtered from baryta is concentrated and separated from the glutinous deposit, a small quantity of which still remains dissolved; the mother-liquor is mixed with a large quantity of sulphuric acid, whereby the hyposulphoglutic acid still in solution is precipitated, and the precipitate is washed with hydrochloric acid, in which it is insoluble. The viscid resinous soda-salt is dissolved in as little water as possible and treated in the same way as the mother-liquor, and the precipitated acid is dried. To purify the product, it is dissolved in ammonia; the excess of ammonia is expelled by evaporation; and the solution is filtered and precipitated with acetate of lead, whereupon a brownish-yellow precipitate is formed, while the pure lead-salt remains

in solution. The filtered solution is heated till the precipitated lead-salt redissolves, then concentrated, and precipitated with basic acetate of lead, and the precipitate is washed and decomposed by sulphuretted hydrogen. The precipitated acid is coloured brown by sulphide of lead; the liquid is therefore digested for 24 to 48 hours between 60° and 80° in a well corked flask, and then filtered. (The brown undissolved lead-salt, treated in a similar manner, yields a clear yellow liquid, containing the same acid, but contaminated with a resin and a colouring matter.) It is best to evaporate the acid thus freed from lead, in vacuo over sulphuric acid, since it becomes coloured in the air. — 2. The acid may be obtained from the mother-liquor of sulphonaphthalate of baryta (p. 14, 3, a), which dries up to a gummy mass. This gummy mass is dissolved in water, and precipitated to a certain extent with subacetate of lead; the precipitate is decomposed by sulphuretted hydrogen, and the filtrate concentrated and mixed with fuming hydrochloric acid, whereby the acid is precipitated almost colourless, while sulphonaphthalic acid remains in solution. (This process yields but little acid, since most of the acid is contained as baryta-salt in the sulphate of baryta employed in the first method of preparation.)

Properties Transparent, uncrystallisable, slightly yellow mass, assured like glass (when spontaneously evaporated in the air, it forms a volter mass without cracks). Dissolves after the glass has been completely dried. Incolorous, and bitter, like sulphonaphthalic acid, but has a slightly acid taste. Reddens litmus.

Dissolved by maric acid, and decomposed on boiling; water precipitates from the solution a pale yellow substance, insoluble in water; the litterate is colouriess, and gives sulphate of baryta with chloride of barium. It the potash-salt be fused with excess of potash until charring begins, and the mass be then treated with dilute sulphuric acid, it evolves sulphurous acid; honce it contains hypesulphuric acid.

With a small quantity of water, it forms a viscid glutinous substance.

Dissolves readily in water, and is precipitated from the solution by sulphuric or hydrocalors acid (but not by nitric acid) as a viscid, glutinous mass.

or hydrocalors acid (but not by nitric acid) as a viscid, glutinous mass.

The disconnected where are destroyed by ignition, with formation of substance; they are slightly soluble in cold water, more abundantly in water water; the portion which remains undissolved melts by heat and becomes opaque.

The potent, sods, and ammonia-salts, resemble in appearance the free acid. It caustic alkali or carbonate (carbonate of ammonia in the case of the ammonia salt) be added to their solution, the greater part of the dissolved salt is precipitated in white scales, which gradually unite into a plutinous mass. The solution of the ammonia-salt yields by evaporation a residue which reddens litmus, still contains ammonia, and exactly resembles the free acid.

Hyposulphoplutate of Baryta. — Melts below 100°. Dissolves in warm water, and is precipitated on cooling; dissolves in warm alcohol. Leaves when ignited 37.3 p. c. BaO,SO³.

outphoglutate of Lead. Melts below 100". Dissolves in warm all is precipitated on cooling. Dissolves in warm alcohol.

aulphoglutic acid is soluble in alcohol, less soluble in ed-

Oxygen-nucleus C20H1O?

Naphthalase. C20H1O?

LAURENT. Ann. Chim. Phys. 59, 326; Rev. scient. 13, 68.

Naphthase.

Formation. By heating nitronaphthalin with hydrate of lime or hydrate of baryta.

Preparation. 1. Nitronaphthalin is heated (as slowly as possible, lest it should take fire, and but little product be obtained), with from 8 to 10 pts. of hydrate of lime in a retort filled up to the neck, whereupon ammonia is evolved and a brown oil (containing much naphthalin) and undecomposed nitronaphthalin pass over, while a thick oil condenses in the neck of the retort, and solidifies on cooling. The lime is blackened from separation of carbon. The neck of the retort is cut off near the bulb and washed, as well as the condenser, with ether, which leaves naphthalase undissolved.—2. A mixture of 1 pt. nitronaphthalin and 8 to 10 pts. hydrate of lime or baryta, is distilled by small portions; the naphthalase condensing in the neck of the retort is collected, washed with other, and distilled; and the solidified distillate is again washed with ether.

Properties. Yellow substance, which begins to sublime at 250°, but does not melt till a stronger heat is applied, when it begins to boil. The vapour is yellow and condenses in small spangles, which are deposited on the neck of the retort in long, yellow needles. When melted, it solidifies in a fibrous mass on cooling.

20 C					85.9
7 H	7	****	5.1		4.8
O	-	-	00000	***************************************	1000

The analysis should be repeated. Perhaps I At. nitronaphthalin forms with I At. water of the hydrate of lime, I At. naphthalin, while another portion is converted into naphthalic and nitric acid, the latter being immediately decomposed by the excess of lime.

Combinations. Naphthalase dissolves in water. — It dissolves in cold oil of vitriol, even in the smallest quantity, with a very intense and beautiful bluish violet colour. The solution in hermetically sealed tubes does not change colour even after two years. On the addition of a little water, the colour turns reddish-violet, and on the addition of more water, pure naphthalase is precipitated, which may again be turned blue by oil of vitriol. The solution in oil of vitriol may be evaporated down for a few moments without losing its colour; but it gradually turns red, and then brown. Even if the naphthalase be first heated with nitric acid or treated with chlorine, the blue colour is still produced on dissolving it in oil of vitriol.

Insoluble in alcohol, scarcely soluble in ether.

Oxygen-nucleus CoHEO3.

Naphthulmin.

 $C_{30}H_6O_6 = C_{30}H_6O_3,O_3$

SCHUTZENBERGER & WILLM. Compt. rend. 46, 894; J. pr. Chem. 74, 75.

Formation and Preparation. When hydrochlorate of naphthalidine is treated with aqueous nitrite of potash, a large quantity of nitrogen is evolved, and a light brown substance insoluble in water is formed, which, when treated with alcohol or with ether, yields a red substance, nitrosonaphthylin, turning blue with acids. There remains a tolerably bulky, ulmin-black, non-azotised residue, which is naphthulmin, and may be purified by solution in oil of vitriol and precipitation with water.

				Sc	hützenberger & Willm.
20 C	120		75.95	•	76.18
6 H	6	••••	3.79	•••••	5.79
40	32		20.26	•••••	20.03
C30H4O4	158		100.00	•••••	100.00

It is therefore the hydride of oxynaphthyl, or at least isomeric (?) with that substance. (Schützenberger & Willm.)

Insoluble in almost all solvents, especially in acids and alkalis. Dissolves in oil of vitriol with indigo-blue colour, and is precipitated therefrom in its original state by water.

Vanillin.

 $C^{90}H^6O^4 = C^{90}H^6O^3,O^2$?

GOBLEY. (1858.) N. J. Pharm. 34, 401. Am. Vée. N. J. Pharm. 34, 412.

Givre de vanille. Mistaken by Buchhols (Repert. 2, 253) and by Vogel for benzoïc acid, previously by Gobley for commarin, and by others for cinnamic acid; first recognized as a distinct body by F. L. Bley (Br. Arch. 28, 132).

Source. In vanille, the fruit of Vanilla aromatica. — It constitutes the crystals which effloresce from the pods (Gobley, Vée); and is deposited from tincture of vanille which has been kept for a long time. (Gobley.)

Preparation. The tincture of vanille, prepared with alcohol of 85 p. c., is evaporated to the consistence of extract, diluted to a syrap with water and shaken up with ether, as long as that liquid takes up colouring matter. The ethereal extracts leave on evaporation a brown, strongly smelling residue, from which boiling water extracts the vanillin, to be purified by animal charcoal and recrystallisation.

Properties. Colourless, long, four-sided, acicular prisms. Has a strong aromatic odour of vanille, and a hot pungent taste. It is hard and cracks between the teeth. Melts at 76° and volatilizes almost completely at 150° in small, brilliant, white crystals. Neutral. (Gobley.) The vanillin effloresced on vanilla-pods melts between 77 and 78°., and reddens litmus (Vée), very slightly (Gobley).

02	****	20 20	*******	20'00
	****		mins	3.98
120	****	75.95	*******	75.22
	120 6 32	6	6 3.79	6 3.79

Almost insoluble in cold, readily soluble in boiling water. (Gobley,

Vée.)

Dissolves without decomposition, in dilute acids, with yellow colour in oil of vitriol. (Gobley.) Dissolves easily in caustic potash, from which it is precipitated unchanged by acids. It does not expel carbonic acid from alkaline carbonates, even on boiling; neither does it combine with bases. (Gobley.)

Dissolves readily in alcohol, ether, and in oils both fat and volatile.

(Gobley.)

Naphthesic Acid. C20H6O8 = C20H6O2,O6?

LAURENT. Rev. scient. 14, 560.

Naphtessäure.

Formation and Preparation. (See page 8.) Naphthalin placed in contact with bichromate of potash, water, and sulphuric acid, is violently attacked if little water is present, slightly if much water be present. If, after the reaction is over, the mass be treated with water, and the solution filtered from undecomposed naphthalin, and left to itself for one or two months, crystals of chrome-alum are deposited, at first pure, but afterwards covered with white granules of the size of a pin's head. When these granules are dissolved in alcohol, they remain, on evaporating the filtered solution, as a crystalline mass, which may be purified by sublimation.

Properties. Crystallises in rhombic needles of 58° and 122°; melts below 100°.

20 C 6 H 8 O	6		2.93
	190	100	100.00

According to a preliminary experiment, the atomic weight is much less than is expressed by this formula. (Laurent.)

Very slightly soluble in water.

Sulphi-nucleus, C20H7(SO2).

Sulphonaphthalin. C*OHT(SO2).

Berzelius. Pogg. 44, 404; Ann. Pharm. 28, 9.
Regnault. Ann. Chim. Phys. 65, 87; J. pr. Chem. 12, 99.
Laurent. Compt. chim. 1849, 390; abstr. Ann. Pharm. 72, 297.
Gerike. Ann. Pharm. 100, 216; Liebig & Kopp's Jahresbericht, 1856, 613 (note).

Oxide of Thiononaphthyl. (Kolbe.)

Formation. (p. 8.) 1. Produced, together with sulphonaphthalide, by the action of fuming sulphuric acid or sulphuric anhydride on naphthalin. (Berzelius.) 2. By dissolving naphthalin in warm sulphuric acid, whereby only a small quantity of sulphonaphthalide is formed. (Berzelius.)

Preparation. Naphthalin is treated with sulphuric anhydride, as in the preparation of sulphonaphthalic acid (p. 15), and by the addition of water to the red product, a mixture of sulphonaphthalin, sulphonaphthalide, and undecomposed naphthalin is precipitated. The last is volatilised by prolonged boiling of the mixture with water. The residue is fatty, sticks to the glass vessel and dissolves very slightly in boiling water, which then becomes opaline on cooling. The residue is treated with cold alcohol, which dissolves scarcely anything but sulphonaphthalin, and the solution is crystallised by spontaneous evaporation. If the solution be evaporated by heat, it becomes turbid on cooling, and deposits a pulverulent mixture of both products, whilst the liquid contains merely traces of sulphonaphthalide. (Berzelius.)

Properties. Soft, laminated nodules (Berzelius); crystalline (Gerike). Melts far below 100° (Berzelius); at 70° (v. Fehling, Handwörterb. v. 439); between 90° and 95° (Gerike), to a yellowish liquid, solidifying in a transparent (gummy, Gerike), highly electric mass. (Berzelius.)

-	7(SO ²)			100.00	marin	100-000
20		16	****	10.06	*******	10.000
7 H	***************************************	7	****	4.40	*******	4.879
20 C		120	****	75-47		74-974
200.000						Berzelius

According to Berzelius, sulphonaphthalin consists of C²⁰H⁸ combined with 1 At-SO²; it is not probable however, that naphthalin exists as such in the compound; neither can it be determined whether sulphonaphthalin is C²⁰H⁸O² + S, or C²⁰H⁸O,SO, or C²⁰H⁸,SO². (Berzelius.) It appears to be analogous to sulphobenzide, and therefore its formula is probably 2(C²⁰H⁷SO²). — (Gericke.)

Decompositions. Heated above its melting point, it gives off fumes, and sublimes as a mealy substance, portions of which are crystalline; the product is partly decomposed sulphonaphthalin. Heated in small tubes, it stills partly in drops, and then evolves sulphurous acid and turns

yellow, brown, and finally black. (Berzelius.) Sablimes partly undecomposed. (Gerike.)

2. Decomposes with fuming nitric acid; water precipitates white

flakes from the solution. (Gerike.)

3. Aqua regia does not form sulphuric acid, even after prolonged boiling; but dissolves the substance after 24 hours' boiling; water precipitates from the solution a substance which exactly resembles sulphonaphthalide, and partly dissolves in ammonia with dark yellow colour. (Berzelius.) 4. Alcoholic potash does not decompose it at a high temperature. (Gericke.)

Combinations. 1. Does not dissolve in water (Gericke), boiling water dissolves only a trace of it, and becomes opaline on cooling (Berzelius). 2. Dissolves in cold alcohol, especially in anhydrous alcohol (Berzelius); scarcely in cold, and somewhat more in hot alcohol. (Gericke.) It is precipitated on cooling from the boiling saturated solution in the form of powder; but if separated before the liquid has cooled down below the melting point of sulphonaphthalin, it is deposited in drops, just as when the solution is evaporated by heat. (Berzelius.)

Appendix to Sulphonaphthalin.

Sulphonaphthalide. C24H10SO2 ?

BERZELIUS. Pogg. 44, 404; Ann. Pharm. 28, 9; J. pr. Chem. 12, 99.

Formation and Preparation. Formed, according to Berzelius, together with sulphonaphthalin, when naphthalin is treated with sulphuric acid, and in still greater quantity, when sulphuric anhydride is employed. The residue left on treating sulphonaphthalin and sulphonaphthalide with cold alcohol (p. 28), is dissolved in boiling alcohol, whereupon the sulphonaphthalide separates on cooling out as a snowwhite powder.

Properties. Colourless; becomes strongly electric when rubbed or stroked with the back of a knife. Melts at a temperature much above 100° C. to a colourless liquid. Does not lose weight at 100°.

							Berzelius.
24	C		144	****	77.72	*******	77.146
10	H	**************	10	****	5.29	*******	5.131
	8	*************	16	***	8.50		
2	0		16		8.49		

According to v. Fehling (Handwörterb, v. 439) it is a mixture of a little naphthalin with sulphonaphthalin. Gerhardt was of the same opinion (Tr. 3, 460). This is rendered very improbable by the much higher melting point of sulphonaphthalide. (Carius.)

Decompositions. 1. Heated above its melting point, it fumes and sublimes with decomposition as a partly crystalline powder. This sublimate melts and solidifies in a crystalline mass on cooling; if the sublimate be dissolved in alcohol, it crystallises out by spontaneous evaporation in small, short, needles acuminated at both ends, and appearing like elongated octabedrons; they have a slight yellow tinge, and are insoluble both in dilute acids and in caustic alkalis. Heated in a glass tube, sulphonaphthalide behaves like sulphonaphthalin.

2. Sulphonaphthalide is but slowly attacked by aqua regia; it coheres, then melts on the surface, and slowly evolves nitric oxide. After prolonged boiling, it dissolves completely, if enough nitric acid is present; and the solution gives with water a white precipitate which assumes a lemon colour on the filter. The filtered liquid does not contain a trace of sulphuric acid, even when heat has been applied for several days; hence the sulphonaphthalide must be converted into another sulphurized body.

3. Heated with nitrate of boryta, it volatilises without oxidation of the sulphur. — 4. On heating it with chlorate of potash and carbonats of soda, a partial decomposition is effected, and the solution of the

residue contains sulphuric acid.

Combinations. Insoluble in water, concentrated nitric acid, and

caustic potash.

Dissolves very slightly, if at all, in cold, and slightly in boiling absolute alcohol, separating out for the most part, on cooling. Very slightly soluble in ether.

Bromine-nucleus C20BrH7.

Bromonaphthalin. CoBrHi.

LAURENT. Ann. Chim. Phys. 59, 216; Ann. Pharm. 12, 187; Fogg. 31, 320; Further, Rev. scient. 12, 195.

Bromonaphtalase, Bronaphtase. (Laurent.) Bromide of naphthyl. (Kolbe.) Brominated naphthalin. (Gerhardt.)

Formation and Preparation. Formed when bromine is brought in contact with excess of naphthalin, a violent action taking place, heat being developed, and hydrobromic acid evolved. With excess of bromine, bibromonaphthalin is likewise formed, and is very difficult to separate from bromonaphthalin, since both are equally soluble in alcohol and other. They may be incompletely separated by distilling the crude oily mixture, bibromonaphthalin passing over towards the last.

Properties. Colourless oil, volatile without decomposition. The crude oil, not previously purified, gave on analysis 50.90 p.c. C. and 2.95 p.c. H, (Laurent.) In accordance with this analysis, Laurent considers the crude oil to be a mixture of 1 At. bromonaphthalin, C²⁰BrH⁷, and 1 At. bibromonaphthalin, C²⁰Br²H⁶.

Decompositions. 1. Bromonaphthalin is not attacked by alcoholic potash. — 2. Bromine converts it into bibromonaphthalin and other brominated products, hydrobromic acid being evolved. — 3. Chlorise forms hydrochlorate of bromochloronaphthalin and an oily compound containing bromine and chlorine. — 4. Sulphuric acid converts it into bromosulphonaphthalic acid.

Conjugated compound of the Bromine-nucleus, CoBrH7.

Bromosulphonaphthalic Acid. C**OBrH**S*O** = C**OBrH**, 2SO*.

LAURENT. Compt. rend. 21, 33; Compt. chim. 1849, 390; abstr. Ann. Pharm. 72, 297; Liebig & Kopp's Jahresb. 1849, 441.

Brominaphtilinschwefelsäure; Bromonaphthylodithionic acid; Brominated Sulphonaphthalic acid.

Known only in combination with bases,

Formation and Preparation of the Potash-salt. Bromonaphthalin is heated with fuming sulphuric acid till complete solution takes place, after which the liquid is diluted with water and neutralised with potash. The whole is then heated to boiling, filtered from a little free bromonaphthalin, and allowed to cool. The crystalline mass which now separates out is washed on a filter and dissolved in boiling alcohol. On cooling, the potash-salt is deposited in crystals.

Decomposition. By boiling nitric acid. If the solution of the potashsalt be evaporated to dryness with nitric acid, and the residue taken up with water and neutralised with potash, a yellow powder, almost insoluble in water, separates out, which deflagrates when heated in sealed vessels, and is therefore probably a nitro-compound.

Bromosulphonaphthalate of Potash. — Colourless, crystallises in nodules.

C2ºBrH6SO2 238.0 KO,SO3 87.2		25.95
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Bromosulphonaphthalate of potash produces in a moderately dilute solution of chloride of calcium, a white precipitate; also in acetate of lead. It does not precipitate salts of magnesium, manganese, cobalt, nickel, zinc, or silver.

Bromosulphonaphthalate of Baryta obtained by double decomposition, separates out from its warm and slightly dilute solution as a crystalline precipitate.

			3	Laurent.	
C ²⁰ BrH ⁶ SO ² BaO,SO ³		67·3 32·7		32.4	
C20BrBaH6,2SO3	354.5	 100.0			П

Bromine-nucleus C"Br3H.

Bibromonaphthalin. C"Br'H".

LAURENT. Ann. Chim. Phys. 59, 216; Ann. Pharm. 12, 187; Popp. 31, 320; Further, Rev. scient. 12, 204.

Brownophlalese, Bronaphlese. (Laurent.) Dekakezyibromür, (Berzelius.) Bro-mide of bromonaphlhyl (Kolbe).

Formation and Preparation. Bromine is added to naphthalin or to bromonaphthalin till no more hydrobromic acid is evolved; and the mass, which solidifies when the reaction is completed, is dissolved in alcohol and left to crystallise. Also formed when Laurent's first bromure de bromaphtine is heated, together with free bromine and terbromonaphthalin. (Comp. p. 34.)

Properties. Long, white, inodorous needles, whose section forms a hexagon with two very acute angles. Melts when heated and solidifies in a fibrous mass when cooled to 59°. Volatile without decomposition.

				Laurent.	
20 C	6	-	2.12		
CMB4H6	286	-	100-00		

Decompositions. Heated on platinum-foil in the flame of a lamp, it burns with a smoky flame, which goes out as soon as the lamp is taken away.—2. Chlorine does not act upon it in the cold; but on heating, quadrichloronaphthalin is formed. 3. Cold nitric acid does not attack it; the boiling acid decomposes it.—4. Sulphur dissolves in bibromonaphthalin when heated; on cooling, both bodies separate in crystals. If heat be applied till the mixture of the two bodies assumes the colour of bromine, it remains fluid for a long time after cooling to 10°. If the mixture be ultimately heated to boiling, it evolves hydrobromic and hydrosulphuric acids, and deposits charcoal.—5. Sulphuric acid appears to be without action on bibromonaphthalin, even when warmed, but chars it slightly. Fuming sulphuric acid forms bibromosulphonaphthalic acid.—6. Potassium decomposes it slightly at a gentle heat, and becomes covered with bromide of potassium; at a strong heat, decomposition suddenly takes place, with evolution of light, and charcoal is deposited.—7. It is not attacked by hydrate of potash.

nbinations. Insoluble in water; very soluble in alcohol and in

Conjugated compounds of the Bromine-nucleus C20 Br2H6.

Bibromosulphonaphthalic Acid.

 $C^{20}Br^2H^6S^2O^6 = C^{20}Br^2H^6,2SO^3.$

I.AURENT. Compt. rend. 21, 33; Compt. chim. 1849, 390; abstr. Ann. Pharm. 72, 297; Liebig & Kopp's Jahresb. 1849, 441.

Bibromonaphthylodithionic acid; Bibrominated sulphonaphthalic acid.

Known only in combination with bases.

Formation and Preparation. Prepared from bibromonaphthalin with fuming sulphuric acid, in the same way as bromosulphonaphthalic acid from bromonaphthalin. The solution is diluted with water, neutralised with potash, and heated to boiling; and the liquid is filtered from the free bibromonaphthalin, and allowed to crystallise by cooling. The bibromosulphonaphthalate of potash thus obtained is purified by recrystallisation.

Poto	sh-salt.			3	Laurent.
C ³⁰ Br ² H ⁵ SO ² KO,SO ³	317 87·2	****	78·4 21·6	,,,,,,,	21.5
C20Br2KH5.2SO3	404.2		100.0		

Bibromosulphonaphthalate of Baryta is obtained by mixing the solution of the potash-salt with a very dilute, boiling solution of chloride of barium. Deposited on cooling as a floculent precipitate, consisting of microscopic crystals.

				2	Laurent.	
C ²⁰ Br ² H ⁵ SO ² BaO,SO ³		****	73·2 26·8		26.6	
C20Br2BaH5,2SO3	433.5		100.0			

Bromine-nucleus C20Br3H5.

Terbromonaphthalin.

C20Br3H5.

LAURENT. Rev. scient. 12, 213; 13, 95.

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Bromnaphtalise, Bronaphtise. (Laurent.) Bromide of bibromonaphthyl.

Formation and Preparation. 1. Bibromonaphthalin is heated with excess of bromine. — 2. Laurent's first bromure de bronaphtine is heated in a retort, whereupon bromine is evolved and a crystalline mixture passes over, consisting of bi- and ter-bromonaphthalin, which are separated by ether. By spontaneous evaporation, the terbromonaphthalin crystallises first, mixed however with bibromonaphthalin.

Properties. Fine yellow needles; melts at about 60°, and then does not sometimes solidify till it has cooled down to the common temperature.

				32-57	
				1·37 65·76	 1.40
C×	P-1H:	363	_	100-00	

It still contained a little bibromonephthalin.

Very slightly soluble in alcohol, moderately soluble in other.

Appendix to Terbromonaphthalin.

Bronaphthin, CaHraBras

LAURENT. Rev. ariew, 12, 204.

Formation and Perparation. Formed, together with several other products, by pouring bromine over bibromonaphthalin. The mixture is extracted with other and the compound is obtained in crystals by spontaneous evaporation.

Properties. Opaque, white microscopic needles united in slightly radiated scales. Melts at 45°, and v. latilises undecomposed.

				Laurent.
20 C	120	\$7.49	•	38-17
5/5/H 2/5/bc	3 3 220	1·73 60:83		1-82
Car-an-	\$23:3	102-00		

It is perhaps = CBR-H' + CBBBBB.

Laurent's First Bromide of Bronaphthin.

Callribus, By

LATRENT. Ret. arient. 13, 95.

Formation and Perparetties. When bibromenaphthalin is exposed to sunshine with an excess of bromine, hydrobromic acid is evolved, and after one or two days, a crystaline mass is deposited, which either consists wholly of the bromide, or contains the compound C* Br*H*, 2HBr as well. If enough bromine has been used, the bromide crystallises in prisms the may be picked out with a pair of forceps. Should the compound

C⁵⁰Br⁵H⁵,2HBr have been likewise formed, the mixture, after repeated washing, must be triturated with ether and dissolved therein, the solution allowed to evaporate slowly, and the crystals picked out.

Properties. Right rhombic prisms, (Fig. 65); $i: t = 115^{\circ} 30'$; $u': t = 109^{\circ}$; $u': u = 142^{\circ}$.

				Laurent.
20 C 120	••••	18.59	••••	19.40
5·5 H 5·5	••••	0.85	******	0.88
6.5 Br 520	•	80.56		
C20H5-5Br6-5 645.5		100.00		

According to v. Fehling (Handwörterb, 5, 456), it is a mixture of C²⁰Br⁴H⁴,2HBr and C²⁰Br⁵H³,2HBr. It is decomposed by distillation, bromine being evolved and a mixture of bi- and terbromonaphthalin passing over. (Laurent.)

Laurent's Second Bromide of Bronaphthin.

C20H5.5Br2.5, Br4.

LAURENT. Rev. scient. 13, 97.

Formation and Preparation. Bibromonaphthalin is heated with excess of bromine, and allowed to stand for two days, the whole being repeatedly heated. A body very slightly soluble in ether is formed, apparently of the same formula as the first bromide of bronaphthin, but crystallising in a different form.

Oblique rectangular prisms $m: t = 90^\circ$; $y: t = 90^\circ$; $y: m = 127^\circ$. Sometimes the angles y, m, t are truncated by the faces a, which obliterate all the others. $a: m = 130^\circ$; $a: t = 120^\circ$.

Laurent's analysis gave 18.94 p. c. C and 0.86 p. c. H.

Evolves bromine and a little hydrobromic acid when heated, and leaves an oil which solidifies in needles on cooling.

Bromine-nucleus C20Br4H4.

Quadribromonaphthalin.

C20Br4H4.

LAURENT. Rev. scient. 12, 221.

Bronaphtose. (Laurent.) Bromide of tribromonaphthyl.

Formation and Preparation. When the bromide C²⁰Br⁴H⁴,2HBr is distilled, hydrobromic acid and a little bromine are evolved, and a white substance distils over, which is a mixture of quadribromonaphthalin with

another body. In order to effect their separation, they are washed with ether, then warmed with ether in a strong sealed tube placed in a water bath at 100°, and after the whole has cooled, the short brilliant prisms of quadribromonaphthalin are picked out from the other substance, which crystallises in very fine needles.

Properties. Oblique prisms with oblique base, exactly resembling quadrichloronaphthalin b. Inclination of the lateral edges = 101° 30′. Inclination of the base to either side = between 101° 30′ and 102°. Volatile without decomposition.

P	rism	8.		Laurent.
20 C 4 H 4 Br	4	••••	0.91	
C20Br4H4	444		100.00	

Hydrate of potash has not the slightest action on this compound. It is slightly soluble in alcohol and in ether.

The substance crystallising in fine needles which accompanies quadribromonaphthalin, is probably isomeric with that compound. The angles of the needles are of 120°; the crystals are very elastic, brittle, and very slightly soluble in ether. (Laurent.)

Hydrobromate of Quadribromonaphthalin.

 $C^{50}Br^5H^5 = C^{50}Br^4H^4,HBr.$

LAURENT. Rev. scient. 13, 94.

Sousbromure de bronaphtise. (Laurent.) Bromure de naphtaline tribromée. (Gerhardt.)

Formation. Sometimes formed, together with the compound C*Br*H*,2HBr, when bibromonaphthalin is treated with bromine. To separate the mixture, it is boiled with ether, in which the bromide C*Br*H*,HBr chiefly dissolves, and is deposited in microscopic needles by the spontaneous evaporation of this solution.

Needles.				Lauren		
20 C 1 5 H 5 Br 4	5	••••	0.95			
C ²⁰ Br ⁴ H ⁴ .HBr 5	25		100.00			

Decomposed by distillation, evolving bromine with a little hydro-bromic acid, and yielding a crystalline sublimate very slightly soluble in other (quadribromonaphthalin?)

Bihydrobromate of Quadribromonaphthalin. C20Br6H6 = C20Br4H4, 2HBr.

LAURENT. Rev. scient. 13, 94.

Bronaphtesbromür, Decahexylsuperbromid.

Formation and Preparation. By pouring bromine over naphthalin or bibromonaphthalin. Sometimes after a few hours a white powder is deposited, which is washed with ether.

Properties. Crystallises by spontaneous evaporation from its boiling ethereal solution, in microscopic rhombic tables.

T	ables			Laurent.
6 H	6	****	19·80 0·99 79·21	 20·49 1·01
C20Br4H4.2HBr	606		100.00	

Decompositions. 1. Decomposes by distillation into hydrobromic acid, a little bromine, and quadribromenaphthalin, which condenses in the neck of the retort. — 2. Decomposed with great difficulty by alcoholic potash, with formation of bromide of potassium. Very slightly soluble in boiling ether.

Bromine-nucleus C20Br5H3.

Bihydrobromate of Pentabromonaphthalin.

C20Br7H5 = C20Br5H3, 2HBr.

LAURENT. Rev. scient. 13, 579.

Bromure de bronaphtise. (Laurent.) Quadribromnaphtylbromür-bibromwasserstoff. (Kolbe.)

Formation and Preparation. By the prolonged action of bromine on bibromonaphthalin or on naphthalin, at a gentle heat, and finally in sunshine. The substance is recrystallised from ether, and the crystals picked out with forceps.

Properties. Crystallises in prisms belonging to the doubly oblique prismatic system, very closely resembling prisms of the oblique prismatic system; like Fig. 112, together with the sides $a; u: u = 110^\circ; i: h$ right = 132°, left = 130° 30′; i: a left = 120°; $i: u = 105^\circ$.

P	rism	8.		Laurent.
20 C				18:01 0:75
7 Br				

C20Br5H3,2HBr...... 685 100.00

38 CONJUGATED COMPOUNDS OF THE CHLORINE-NUCLEUS CPCIH7.

Decomposed by distillation, bromine being evolved and another product formed which has not yet been investigated.

Very slightly soluble in ether.

Chlorine-nucleus CoClH7.

Chloronaphthalin. CoclH7.

LAURENT. Ann. Chim. Phys. 59, 196; abstr. Ann. Pharm. 8, 8; Bers. Jahresb. 16, 350. — Rev. scient. 13, 78, & 92. — ZININ. J. pr. Chem. 33, 36.

Chlornaphtalas, Chlornaphtas. (Laurent.) Ikodekatesserylchlorür. (Berzelius.) Naphtaline chlorée. (Gerhardt.) Chloronaphthalid. (Mitscherlich.) a- Chloronaphthalid. (Löwig.)

Formation and Preparation. 1. Hydrochlorate of chloronaphthalin is repeatedly distilled over hydrate of lime.—2. Hydrochlorate of chloronaphthalin is boiled with alcoholic potash, and the oily compound thus liberated is precipitated by adding water, and purified by distillation. (Laurent.)

Properties. Colourless, transparent oil; combustible; distils without decomposition.

	Oil.			Laurent.
20 C				
7 H			•••••	4.00
C1	35.5	 21.85		
C20C1H7	162.5	 100.00		

Decompositions. 1. Heated with oil of vitriol, it is converted into chlorosulphonaphthalic acid (Zinin); it is not attacked by sulphuric acid (Laurent). 2. Decomposed by bromine with violent effervescence; hydrobromic acid being evolved, and bihydrobromate of terbromochloronaphthalin (C²⁰Br²ClH⁴,2HBr), being formed.—3. Chlorine converts it into a peculiar oil which is changed into a-terchloronaphthalin by hydrate of potash. If the action of the chlorine is aided by a gentle heat, ter- or quadrichloronaphthalin is directly formed.—4. Not attacked by hydrate of potash. (Laurent.)

Conjugated compounds of the Chlorine-nucleus ConCIH1.

Chlorosulphonaphthalic Acid.

C'CIH', 2SO3.

Zinin. J. pr. Chem. 33, 36.

Chloreulfunaphtalinzäure, Chlorohyposulphonaphthalasic acid. (Laurent.) Acide sulfunaphtalique chloré. (Gerhardt.)

Formation and Preparation. 1 vol. of purified chloronaphthalin is mixed with 2 vols. of sulphuric acid, and the mixture heated for a

quarter of an hour in an oil-bath to 140°. A transparent, brownish liquid is thereby obtained, which is not changed by cooling, but on the addition of a few drops of water, solidifies in a white, buttery, crystalline mass, which must be placed upon a porous tile to absorb the excess of sulphuric acid. (Zinin.) The same acid is also probably obtained by treating hydrochlorate of chloronaphthalin with fuming sulphuric acid, hydrochloric acid gas being evolved. (Laurent.)

Properties. Melts by heat to a brownish liquid, and then decomposes, diffusing an odour of naphthalin.

Combinations. Readily soluble in water.

Forms with bases chiefly soluble salts; with ammonia, a white, easily soluble, non-crystalline mass; with potash, a dull, white powder, but slightly soluble in water and in alcohol; this gave according to Zinin's analysis, 16.71 p. c. KO, (the formula C²⁰ClH⁶K,2SO³ requires 16.8 p. c. KO).

Chlorosulphonaphthalate of Baryta. Dull white, microscopic needles, difficultly soluble.

					Zinin. at. 150°.	
20 C	120	****	38.69	*******	38.77	
6 H	6		1.94		2.13	
Cl	35.5	****	11.46		11.18	
BaO	76.6		24.69	*******	25.65	
5 0	40		12.90		11-96	
2 S	32	****	10.32		10.31	
C20C1H6Ba,2SO3	310.1		100.00		100.00	

Cuprous chlorosulphonaphthalate is a white flocculent precipitate; the cupric salt is bluish and readily soluble; the lead-salt a white, almost insoluble body; the silver-salt a white, curdy, precipitate, slightly soluble in water, and decomposing at 100° C.

Chlorosulphonaphthalic acid dissolves easily in alcohol.

Hydrochlorate of Chloronaphthalin.

C20Cl2H6 = C20ClH7, HCl.

LAURENT. Ann. Chim. Phys. 52, 275; Ann. Chim. Phys. 59, 196; Ann. Pharm. 8, 8; Pogg. 29, 77; abstr. Berz. Jahresb. 16, 350; Rev. scient. 13, 76.

Hydrochlorate of Chlornaphthalase, or Chlonaphthase. (Laurent.) Bichloride of naphthalin. (Berzelius.) Naphtalidchlorür, (Mitscherlich.) Naphtylchlorür-chlorwasserstoff. (Kolbe.) Chlorure de naphtaline. (Gerhardt.)

Formation. Hydrochlorate of chloronaphthalin is the first product of the action of chlorine upon naphthalin.

Preparation. 1. When dry chlorine gas is passed at the common temperature over naphthalin, a violent action immediately sets in; the naphthalin melts, and when the stream of chlorine is rapid, partly sublimes as solid C²⁰Cl²H⁶,2HCl, hydrochloric acid being liberated at the same time. The mass gradually thickens, owing to the formation of a granular substance, and after a while assumes the consistence of solidified olive oil. The same product is formed, when, in preparing naphthalin according to the method given at p. 4, chlorine is passed too long into the tar. If all the naphthalin has not been attacked, the mass must be gently warmed till it melts, and again treated with chlorine. After the reaction is terminated, the mass consists of solid and liquid hydrochlorate of chloronaphthalin; it is shaken up with ether in a glass tube, the liquid decanted, and the mass treated in the same way three or four times, and then filtered. The whole of the ethereal solutions are distilled till the greater part of the ether is volatilised, and the residue, which still contains ether, is maintained at a temperature of — 10°, as long as it continues to deposit solid chloride. The oily chloride is now removed with a pipette from the crystals, and the ether is evaporated by a gentle heat. The fluid chloride thus obtained, invariably contains a small quantity of the solid chloride. (Laurent, Ann. Chim. Phys. 52, 275.)

2. The following is a better method. Chlorine is passed over naphthalin, till the resulting oily compound, which had become heated during the reaction, begins to deposit a white granular mass. The oily liquid thus formed is a mixture of naphthalin, the oil C²⁰ClH⁷,HCl, and the crystalline body C²⁰Cl²H⁶,2HCl. (If an attempt were made to convert all the naphthalin, there would be a risk of transforming the two chlorine-compounds into other compounds closely resembling them.) In order to partially remove the naphthalin, the mixture is heated in a dish for a long time between 50° and 60°; the residue is afterwards dissolved in ether, and the solution is kept for some time at —10°. The residual ethereal solution is mixed with alcohol and exposed to the air in an open beaker, until \(\frac{2}{3}\) of the oil have been deposited; this portion contains the oily chloride. The third-fifth is collected apart; it is the solid chloride in a state of perfect purity; while the \(\frac{2}{3}\) still in solution contain naphthalin. (Laurent, Ann. Chim. Phys. 59, 196.)

Properties. Pale yellow oil, heavier than water, and smelling like the solid bihydrochlorate of bichloronaphthalin (CooCloHe,2HCl).

	Oil.			1		urent	d analysis.
20 C 8 H 2 Cl	8	****	60·30 4·02 35·68	*******	61·435 3·525		3.60
C20C1H7, HC1	199		100-00				

Decompositions. 1. Hydrochlorate of chloronaphthalin cannot be made to burn of itself, but must first be mixed with some combustible body, such as paper or wood, when it burns with a green-edged smoky flame.—2. Decomposes partly by distillation, hydrochloric acid gas being evolved and chloronaphthalin (C²⁰ClH³) being formed. When redistilled six times, whereupon a little hydrochloric acid is each time evolved, it is converted into a colourless oil, which has the composition of a sub-hydrochlorate, since it contains 67.81 p. c. C and 3.86 p. c. H,

and probably corresponds to the formula $2(C^{20}ClH^7)$, HCl; it may however not be a pure product, since it loses by repeated distillation as much hydrochloric acid as it had already parted with. (Laurent.)—3. Hydrochlorate of chloronaphthalin is decomposed very slowly by potassium, even at the boiling heat, into chloride of potassium and an oil; it was for this reason that Laurent (Ann. Chim. Phys. 52, 275) formerly supposed that it was not decomposed by potassium, but that the formation of chloride of potassium was owing to decomposition of solid chloride contained in the liquid. (Laurent.) 4. Distilled over fragments of potash, it parts with hydrochloric acid; the decomposition is more complete than by distillation per se, chloride of potassium being formed and chloronaphthalin obtained as distillate; but to decompose the oil effectually, it is necessary to repeat the operation three or four times. (Laurent, Ann. Chim. Phys. 59, 196.) Alcoholic potash decomposes it readily and completely into chloride of potassium and chloronaphthalin. (Laurent, Rev. Scient. 13, 76.)—5. By bromine it is converted into chlorenbronaphtone B (?).—6. Chlorine converts it slowly into solid $C^{20}Cl^2H^6$, 2HCl; but when heat is applied, bihydrochlorate of terchloronaphthalin is formed. This last body is produced in this reaction in two modifications:

$C^{20}ClH^7,HCl + Cl^4 = HCl + C^{20}Cl^3H^5,2HCl.$

If too great a heat be applied during the action of the chlorine, terchloronaphthalin A is also formed, or the products of its decomposition by the

action of chlorine. (Laurent.)

7. Nitric acid slowly converts it into a yellow, glutinous, and viscid mass.—8. Dissolves in hot fuming sulphuric acid, with evolution of hydrochloric acid gas; the resulting liquid diluted with water and saturated with carbonate of baryta, yields an almost insoluble salt. (Laurent.)

Combinations. Insoluble in water. Dissolves readily in alcohol, still more and in every proportion in ether.

Chlorine-nucleus C20Cl2H6.

Bichloronaphthalin. C20Cl2H6.

LAURENT. Ann. Chim. Phys. 59, 196; abstr. Ann. Pharm. 8, 8; Berz. Jahres. 16, 350; Further, Compt. rend. 21, 35; Rev. scient. 12, 196; Compt. chim. 1850, 1 & 7; abstr. Ann. Pharm. 76, 399.

Chlornophtalese, Chlornaphtese. (Laurent.) Dekahexylchlorür. (Berzelius.) Naphtalidehlorid. (Mitscherlich.) Naphtaline bichlorée. (Gerhardt.) Chloride of chloronaphthyl. (Kolbe)

Formation. According to Laurent, bichloronaphthalin exists in seven different modifications. It is formed: 1. from a-hydrochlorate of bichloronaphthalin; a. by distillation, in the modifications A, C, F, and X;—b. by decomposition with potash, in modifications E, and AD—c. by alcoholic ammonia, in the modification C.—It is formed: 2. from β -bihydrochlorate of bichloronaphthalin; a. by distillation, in the modification C.;—b. by decomposition with potash, in the modification F, together with an oil.—Formed: 3. in the modification G, by treating binitronaphthalin with chlorine.

Chief characteristics of the Bichloronaphthalins. (Laurent. Rev. scient. 12, 203.)

-	A.	C.	AD.	E.	F.	X.	Y.
Form	Fluid	Needles of 112° 30'	Needles of 122°	Needles of 94°	Tables 103°	Fluid	Sub- limed lamins
Melting point	144	50°	28 -30°	31°	101°		
Forms with chlorine	Oily A-bihy- drochlorate of quadri- chloronaph- thalin, which is converted by potash into A-quad- richloronaph- thalin	rate of quad- richloronaph- thalin C	naphtha-	****	Laminæ of chlo- naph- tone	Oily X-bihy- drochlorate of quadri- chloronaph- thalin, which is converted by potash into E quad- richloro- naphthalin	
Forms with bro- mine	****	Bihydrobro- mate of bibro- mobichloro- naphthalin	Bromo- bichloro- naphtha- lin A		Bibro- mobi- chloro- naphtha- lin B	An oil	

a. Isomeric bichloronaphthalins formed by the distillation of a - C™Cl³H³, 2HCl.

3. Chloride of sulphur (which?) is heated in a flask, and naphthalia gradually added, whereupon hydrochloric acid is evolved. After the action has ceased, water and ammonia are added, whereupon a soft,

^{1.} Modification C. Obtained by the distillation of a - C²⁰Cl²H⁶, 2HCl, hydrochloric acid gas being evolved. It is obtained mixed with a peculiar oil (the quantity of which increases with the rapidity of the distillation), and with undecomposed chloride; for this reason, the distillation must be repeated in order to decompose the latter. The product is pressed between blotting paper, dissolved in alcohol at the common temperature, and crystallised by cooling the solution to —5° or —10° C. (Laurent, Ann. Chim. Phys. 59, 196.) —2. The oily distillate of a - C²⁰Cl²H⁶, 2HCl deposits, after varying intervals of time, at first chiefly rhombic tablets of bichloronaphthalin F, from which the oil is decanted, and then needles of C. — Bichloronaphthalin X, which is likewise present, but in very varying proportions, is removed with a pipette when the quantity is considerable; the crystals are further pressed between blotting paper, dissolved in etheralcohol (more advantageously in ether, if the substance still contains rhombic tablets); and the liquid is allowed to evaporate spontaneously in a flat-bottomed flask. As soon as all the ether is evaporated, but not the small quantity of alcohol, the crystals are thrown upon paper, and if any rhombic tablets are mixed with them, they are picked out with forceps. (Laurent.)

brown mixture of sulphur and a crystallisable substance is produced, from which bichloronaphthalin C is extracted by boiling alcohol and crystallises out on cooling. (Laurent.)

Properties. Crystallises from alcohol in long transparent needles

having a rhombic section (of 111° or 112°) and terminated by very acute pyramids. Generally two such prisms are joined together lengthways, so that hemitrophy results, just as in the case of sphene. The crystals obtained from ether, though tolerably large, are nevertheless extremely irregular. Melts about 50° to a colourless oil, solidifying at 44° in a fibrous mass. Distils without decomposition. Inodorous and tasteless.

					aurei	
N	eedles			a.		b.
20 C	120		60.87	 61.62	****	60.73
6 H	6	****	3.04	 2.90	****	2.96
2 Cl	71	****	36.09			
C20Cl2H6	197		100.00			

& was prepared by the third method.

Decompositions. 1. Forms with chlorine at ordinary temperatures, bihydrochlorate of quadrichloronaphthalin; by heat, chiefly the modifications b and c of quadrichloronaphthalin.—2 With bromine at ordinary temperatures it forms bihydrobromate of bibromobichloronaphthalin. -3. Nitric, hydrochloric and sulphuric acids are without action upon it. - (Laurent.) Fuming sulphuric acid dissolves it when heated, with formation of bichlorosulphonaphthalic acid (Zinin, J. pr. Chem. 33, 37.)

4. It is not attacked by potassium in the cold, but between 30° and 40° it is decomposed, with evolution of light and deposition of carbon. - 5. Very concentrated solution of potash does not attack it, even on boiling.

Insoluble in water; very soluble in alcohol and in ether.

2. Modification F, is contained, according to Laurent, in the oily distillate from the chloride a - C²⁰Cl²H⁶,2HCl (see modification C; preparation 2, p. 40). The oil above the rhombic tablets is decanted; the crystals are dissolved in ether; and the solution is placed in a flat-bottomed flask, and allowed to evaporate very slowly. After two or three days beautiful rhombic tablets are formed, mixed with a few acicular groups of C; these latter are first picked out as completely as possible, and the crystals are then washed with ether, which dissolves the tablets less rapidly than the needles. The tablets are finally recrystallised once or twice from ether. (Laurent.)

Properties. Colourless, inodorous, rhombic tablets, with angles of 77° and 103°. Melts at 101°, and on cooling solidifies in a scaly mass.

Distils without decomposition.

20 C 6 H 2 Cl	6	****	60·85 3·05 36·10	 Laurent. 60.45 3.08
C20Cl2H6	197		100.00	

Decompositions. 1. Not attacked by alcoholic potash. - 2. Converted by bromine into bibromo-bichloronaphthalin b. - 3. Forms a substitutionproduct with chlorine. - 4. Dissolved by warm fuming sulphuric acid; the solution is not precipitated by water.

Dissolves readily in alcohol and in ether.

Modification X is produced, together with the two previous modifications C and F, by distilling a- CooCloH6,2HCl and forms the oil decanted from these two. According to Laurent, the more rapid the distillation, the more abundantly is the oil formed; but he does not mention how this liquid modification X, is to be separated from the oily modification A (4), which is also produced in the distillation. (Carius.) Sometimes the distillate does not solidify on cooling, or only becomes partially solid. In order to purify the decanted oil, it is dissolved in alcohol; the solution is cooled to — 8° or — 10°, and decanted from the crystals hereby deposited; and the oil is precipitated by the addition of water. (Laurent.)

Properties. Distils without decomposition. Contains 60.5 p.c. C and 3.0 p.c. H. (Laurent.)

Converted by chlorine into oily bihydrochlorate of quadrichloronaphthalin X .- It is not decomposed by alcoholic potash.

Modification A is obtained by redistilling the chloride a ConCloth, Modification A is obtained by redistilling the chloride a C[∞]ClⁿH^{*}.
 2HCl four or five times, whereby the modification C is completely decomposed.

Properties. Oil, not decomposed by distillation, and containing 60.5

p. c. C. and 3.2 p. c. H. (Laurent.)

Converted by chlorine into oily hydrochlorate of quadrichloronaphthalin A .- Not attacked by hydrate of potash.

- b. Isomeric bichloronaphthalins obtained by decomposing a-bihydrochlorate of bichloronaphthalin with alcoholic potash.
- 5. Modification AD. Parachloronaphthalose (Laurent). a-bihydrochlorate of bichloronaphthalin is distilled upwards for an hour in a longnecked flask with concentrated alcoholic potash; the liquid is precipitated with water; and the precipitated oil is redistilled with alcoholic potash in the same way, then reprecipitated by water, freed from adhering potash, chloride of potassium and alcohol by washing with water, and finally dried. The colourless or faintly yellowish oil thus obtained, gradually solidifies in a white nacreous mass, which is purified from adhering oil by pressing between blotting paper, and then dissolved in ether-alcohol. By cooling the solution to —5 or —10°, crystals are obtained, which are separated from the mother-liquor and dried. The crystals may sometimes contain a little bihydrochlorate of bichloronaphthalin; in this case, the ethereal solution, by slow evaporation, first deposits this substance in rhombic lamine which are less readily fusible and less soluble in ether than AD. (Laurent.)

Properties. Colourless, acute laminæ, or rather long rhombic needles of 122° (Laurent, Rev. scient. 13, 72). Melts between 28 and 30°; but does not solidify till cooled to 18° or 20°, and then forms a nacreous, but

not fibrous mass. Volatile without decomposition. Inodorous.

20	0	Needles or			60.87		Laurent.
20	C	***********	120	****		anem.	-
6	H	***********	6	-	3.04	*******	2.90
					36-09		

Decompositions. 1. Unattacked by acids. - 2. Fuming sulphuric acid behaves with this compound as with the isomeric compound C-bichloronaphthalin. — 3. With chlorine it forms, when warmed, terchloronaphthalin AC. — 4. With bromine, hydrobromate of bromobichloronaphthalin A, with evolution of hydrobromic acid .- 5. Decomposed by potassium between 40° and 50°, with evolution of light and separation of carbon. - 6. Not attacked by hydrate of potash.

Insoluble in water; very soluble in alcohol and in ether.

6. Modification E is found in the alcoholic mother liquor from which AD has crystallised by refrigeration (comp. p. 44), and is obtained by spontaneous evaporation.

Properties. Very well defined, brilliant six-sided prisms of 94°, larger than the crystals of AD. Melts at 31°, and distils unchanged.

Laurent found 60.76 p. c. C. and 3.06 p. c. H.

Decompositions. 1. Treated with bromine, it evolves hydrobromic acid. - 2. Behaves with sulphuric acid like the other modifications of bichloronaphthalin. — 3. It is not acted upon by hydrate of potash.

- c. Bichloronaphthalin formed by treating binitronaphthalin with chlorine gas.
- 7. Modification Y. Chlorine is passed through fused binitronaphthalin. If the heat does not exceed the melting point of binitronaphthalin, and the decomposition is not thoroughly effected, a mixture of undecomposed binitronaphthalin, oily hydrochlorate of terchloronaphthalin, and bichloronaphthalin Y is obtained, nitrous fumes being evolved. If more chlorine is used and the temperature raised higher, terchloronaphthalin A is formed. First the oily chloride is removed with a little ether, and then the bichloronaphthalin is extracted from the residue by more ether, (the binitronaphthalin remains undissolved), and it is purified by recrystallising once or twice, and finally sublimed or distilled. (Laurent, Rev. scient. 12, 202.)

Properties. Forms by sublimation, white needles, the exact form of which cannot be determined. In order to obtain fine sublimed scales, the substance is put on a small dish and placed on a sand-bath heated to 100°, the whole being covered with a low bell-jar. It melts at 35°, and crystallises in needles on cooling. Laurent found 60.45 p. c. C.

and 3.03 p. c. H.

Of all the modifications of bichloronaphthalin, this is the least soluble in alcohol and in ether.

Conjugated Compounds of the Chlorine-nucleus C20Cl2H6.

Bichlorosulphonaphthalic Acid.

 $C^{20}Cl^2H^6S^2O^6 = C^{20}Cl^2H^6,2SO^3.$

ZININ. J. pr. Chem. 33, 37.

Chlorohyposulphonaphthalesic acid. (Laurent.) Bichloronaphthylodithionic acid. (Kolbe.) Acide sulfonaphtalique bichloré. (Gerhardt.) Bichlornaphtalinschwefelsizure.

Sulphuric acid acts upon bichloronaphthalin as upon chloronaphthalin, and forms a white buttery acid, somewhat more consistent than chlorosulphonaphthalic acid. (Zinin.)

The ammonia-salt is exceedingly soluble.

The potash-salt forms small needles having a fatty lustre, sparingly soluble. Contains 14.74 p. c. KO.

Baryta-salt. Small, white needles having a fatty lustre; sparingly

soluble.

					Zinin. at 150°.
20 C	120		34.82		34.85
5 H	5		1.46	********	1:50
2 Cl	71	****	20.60	*******	20.57
BaO	76.6		22.20		22.07
5 0	40		11.63		11-42
28	32	****	9.29		9.59
C ²⁰ Cl ² H ³ Ba,2SO ³	344.6		100.00		100-00

Silver-salt. White, brilliant laminæ sparingly soluble. Zinin found 29.89 p. c. AgO; the calculation requires 30.23 p. c.

Bihydrochlorate of Bichloronaphthalin.

C20H6Cl4 = C20Cl2H6, 2HCl.

Dumas. Ann. Chim. Phys. 50, 182.

LAURENT. Ann. Chim. Phys. 52, 275; 59, 196; Further, Rev. scient. 6, 29; 13, 72; Further, Ann. Chim. Phys. 74, 26; Further, Compt. rend. 21, 35; Compt. chim. 1850, 1; abstr. Ann. Pharm. 76, 298; Liebig & Kopp's Jahresb. 1850, 497.

DE MARIGNAC. Ann. Pharm. 38, 40.

Hydrochlorate de chloronaphtalese. (Laurent.) Bichlorure de naphtaline. (Gerhardt.) Chlornaphtylchlorür-bichlorwasserstoff. (Kolbe.)

Formation. By the action of chlorine upon naphthalin. If the stream of chlorine gas be not too long continued, hydrochloric acid gas is evolved and a buttery mass resembling frozen olive-oil is obtained, which, together with undecomposed naphthalin, contains hydrochlorate of chloronaphthalin, and the modifications a and B of bihydrochlorate of bichloronaphthalin. (Laurent.)

1. Modification a.

Preparation. The buttery mixture of the chloride (see formation) is washed four or five times by decantation with ether, collected on a filter, pressed between blotting paper, dried and fused. (Laurent, Ann. Chim. Phys. 52, 275; De Marignae.) Since the chloride may be converted by excess of chlorine into new compounds closely resembling it, the stream of chlorine must be interrupted before all the naphthalin is decomposed; and in order to partly remove the latter, the product is warmed for a long time in a dish, between 50° and 60° C, then dissolved in ether, and the solution maintained for some time at a temperature of 10°C, whereupon the greater part of the solid chloride separates out; or the product is mixed with a little ether, in order to make it more liquid; the oil is decanted after 24 hours; and the residue is repeatedly washed on a filter with other. (Laurent.)

To purify the product, it is either (a.) dissolved in boiling ether, the

substance yielding on cooling, very white, more or less crystalline chloride.

Or, (b. a cheaper method, since less ether is required for solution) the mass, after being washed with ether, is dissolved in rock-oil, which dissolves the chloride very abundantly, and on cooling rapidly deposits it at even a few degrees below the boiling point, and when quite cold retains only traces in solution. The crystals are collected on a funnel and washed with a little ether. (Laurent, Rev. scient. 13, 72.)

Properties. Obtained either as a white, shining powder, or, when crystallised from ether, in transparent, vitreous, rhombic laminæ. As however only a small quantity of the chloride is dissolved by ether, it is better to heat it with 30 or 40 times its bulk of ether, in a sealed flask to a few degrees above the boiling point of ether, and then to cool the solution slowly. (Laurent.) Crystallises from rock-oil in crystals resembling rhombohedrons, with the cracked laminated appearance of calc-spar. Crystallised from ether, it forms oblique rhomboidal tablets; — Lateral angles = 109°, inclination of bases to side = 108° 30′ (Laurent, Compt. rend. 20, 363); or in oblique rhombic prisms; — Angles of the rhombic base = about 75° and 105°, the obtuse angles being truncated. (Laurent, Ann. Chim. Phys. 52, 275.) Heated with ether to 100° in a sealed glass tube, it crystallises on cooling in the form of fig. 113; a and a much more upright, the faces k being wanting; faces i, u, u' predominating; h- faces are always present; on the other hand, faces a, m, and a, (which are wanting in Fig. 113) seldom occur, u: u = 109° (hence they more resemble fig. 86: Gm.), i: u = 108° 30′; i: f (behind) 121° 40′; h: h (below) = 118°; u: h = 129° 50′; i: t (y: m) = 113°; t: f = 147°; i: a = 144° (about); m (Fig. 115): a = 139° 30′ or, on the other side, 137° 30′; i: m left = 92° and right = 88°. (Laurent, Rev. scient. 13, 72.) Melts at 160°, and solidifies in a crystalline mass on cooling. (Laurent.) If a crystal thereof be thrown into the partly fused chloride, the whole mass solidifies at about 150° in perfectly well defined rhombic tablets. If, however, the substance has been completely fused, and is then allowed to cool without adding a crystal, the mass solidifies sometimes at 150° in rhombic crystals, sometimes between 110° and 100° in radiated needles. Very brittle, pulverisable, inodorous, and permanent in the air. May be volatilised undecomposed in a glass tube through which a stream of gas is passing. (Laurent.)

					Laurent.		Dumas.	. 1	Marignac.
20 C					45.13				
4 Cl	142	****	52.61	******		****		***	52.20
- C20Cl2H6,2HCl	273	****	100.00						99.96

Laurent formerly considered the chloride to be bihydrochlorate of bichloronaphthalin; afterwards C20H8Cl4.

Decompositions. 1. Strongly heated in a retort, it begins to boil, evolves hydrochloric acid, and yields an oily distillate, which soon solidifies in crystals, and is a mixture of the four bichloronaphthalins C, F, H, and A (occurring in different proportions according to the temperature at which the distillation takes place), and a little undecomposed chloride. There remains in the retort a small quantity of porous charcoal, amounting, after washing with alcohol, to 1 or 2 p. c. of the chloride employed. (Laurent.) 2. It is not combustible of itself, even in the gaseous state; melted on paper, and lighted, it burns with a

f. Zinona, deeply green-edged flame. Laurent.) -3. Browing converts it in sanchine into bibromo-terchloromaputhalia and other compounds. Concent. 4. It is converted by chloring at a gentle heat, into bihydroen wave of chloronaphthalin, taking up 2 At. chlorine, and parting with I At. HO; at a higher temperature, other products are likewise formed. 7 The chloride is attacked only by boiling nitric acid. and yields force when a portion still remains undecomposed) phthalic and oxalic acide, a thick oil being at the same time obtained, from which ether preespects to a cyclifforn applicable. Colf. C.O. (Laurent). During the reaction approbant nitrons fumes are evolved, and a little chloride of binitermethylene (C:X',Cl') passes over with the nitric acid (vii, 360); the acid in the readue appears to differ from Laurent's phthalic acid (Marignac). - 6. Hydrochloric ucid is without action on this compound. - 7. Sulphuric acid is also inert in the cold; but on prolonged boiling, decomposition takes place, with evolution of hydrochloric acid, and formation of : I, a substance which is insoluble in water, soluble in ether, leaves a transporent varnish on the evaporation of the ethereal solution, and is decomposed by heat, yielding an oil which on cooling solidifies in a transparent fiscared mass; 2, a substance which remains dissolved in the sulphuric acid the solution saturated with baryta yielding a salt resembling sulphonaphthalate of baryta. (Laurent, Ann. Chim. Phys. 59, 196.) 8. Heated with fuming sulphuric acid, it evolves hydrochloric acid; — the liquid, diluted with water, saturated with baryta, filtered and evaporated down, yields a very soluble baryta-salt, which crystallises with difficulty, and contains both chlorine and sulphur. (Laurent, Rev. scient. 13, 72.) — 9. Decomposed by potassium at, or a little above, the common temperature, with slight explosion and evolution of light, chloride of potassium being formed and much carbon separated; Laurent, by performing the experiment in a glass tube, obtained a small quantity of a gas which burned with a green flame. — 10. It is not attacked by potash in the cold; on boiling, chloride of potassium and a new crystallisable substance are formed. (Laurent.) It is decomposed by boiling alcoholic potash into chloride of potassium and the two modifications E and AD of bichloronaphthalin. (Laurent. Rev. scient. 13, 72.) - 11. Decomposed by alcoholic ammonia, but slowly. bichloronaphthalin C being apparently formed. (Laurent.) - 12. Boiled with alcoholic sulphide of ammonium, it forms a new compound, saithe in alcohol and in ether, and containing sulphur, chlorine, and extres. (Laurent.)

Combinations. Insoluble in water. Scarcely soluble in edd and very slightly soluble in boiling alcohol, from which, on confirm is almost completely deposited in small scales. It dissolves somewhat more freely in other, especially at 100° (in a sealed tube). Pressives very sparingly in cold, and abundantly in boiling rock-at. (Larrent)

2. Molivertion B. Formation (p. 46).

Preparation. That portion of the buttery mixture, charines, by an action of chlorine upon naphthalin, which remains liquid after randing a dissolved in a lattle other, and maintained at 0 for 48 hours, whosemout the mixture a did not like frozen office dil. The deposit is reduction a bon a piece of the finen and the mether-liquor again content whosem more of the add product is obtained. Both portions are present and

dissolved in a little ether containing 1 or 10 of alcohol. The solution, allowed to stand in an imperfectly closed vessel, deposits in the course of a few days a crystalline mass, which is filtered off and pressed. This is a mixture of the modification u, which is slightly soluble in ether, and scarcely soluble in alcohol, and of the modification β , which dissolves readily in alcohol, and still more in ether. The whole is dissolved in boiling alcohol, and very slowly cooled, and the modification a, which crystallises first, is separated by decanting the liquid; this liquid, by spontaneous evaporation, yields first the modification a, and then mixtures of the two modifications, which are treated separately with a little ether, whereby the modification β is dissolved immediately, and the modification a more slowly in proportion as the crystals are larger. The product is now repeatedly recrystallised, till the crystalline mass is dissolved by ether immediately and without residue. (Laurent, Compt. Chim. 1850, 1.)

Properties. Colourless, inodorous; crystallises in small flakes, often united in large balls. When fused and cooled to 10° C., it does not solidify immediately, but gradually, in radiated spheres often more than an inch in diameter.

20 C 8 H		 44·51 2·95	*******	
4 Cl	142	 52.54		10000
C20Cl2H6,2HCl	270	 100.00		

Decompositions. 1. Resolved by distillation into hydrochloric acid and oil, and bichloronaphthalin C. (needles of 112°). - 2. Bromine converts it into bihydrochlorate of bromochloronaphthalin, C20C1BrH6,2HC1. - 3. Decomposed by boiling alcoholic potash into chloride of potassium, an oil, and bichloronaphthalin F. - 4. If alcoholic sulphide of ammonium be poured into a boiling alcoholic solution of the chloride, the liquid turns brown, becomes turbid in a few seconds, and deposits an abundant precipitate resembling flowers of sulphur, and containing chlorine, sulphur, and oxygen.

Chlorine-nucleus C20Cl3H5.

Terchloronaphthalin. C20Cl3H5.

URENT. Ann. Chim. Phys. 66, 152, and 199; Further, Rev. scient. 12, 206; Further, Compt. rend. 15, 739; Further, Compt. rend. 21, 35; Compt. chim. 1850, 1; abstr. Ann. Pharm. 76, 300; Liebig & Kopp's Jahresb. 1850, 498.

ZININ. J. pr. Chem. 27, 152.

Chlornaphtalis, Chlornaphtis. (Laurent.) Dekapentylchlorid. (Berzelius.) Naphtaline trichlorée. (Gerhardt.)

Obtained by Laurent in seven different modifications, formed under different circumstances. — Laurent (Ann. Chim. Phys. 66, 152) states his belief that he had often previously obtained terchloronaphthalin; but as the crystals were soft like wax, he mistook them for a mixture of quadrichloronaphthalin with an oil, and indeed he was ultimately of opinion that, in every case in which he formerly supposed that he had VOL. XIV.

obtained quadrichloronaphthalin by the action of chlorine on various compounds, the compound, described as such, was really terchloronaphthalin, with the exception of that obtained by the decomposition of bihydrochlorate of quadrichloronaphthalin.

- Formation. 1. Modification A. 1. Obtained by treating hydrochlorate of chloronaphthalin with chlorine, and boiling the oily product with potash. (Laurent.) 2. By treating nitro- or binitro-naphthalin with chlorine. (Laurent.)
- 2. Modification AC. By treating fused bichloronaphthalin with chlorine, hydrochloric acid being evolved. (Laurent.)
- 3. Modification D, is formed together with A, when bihydrochlorate of terchloronaphthalin is distilled.
- 4. Modifications C and (5) G are formed simultaneously, together with A, when bihydrochlorate of terchloronaphthalin is boiled with potash.
- 6. Modification AD. Obtained by Laurent by decomposing the bihydrochlorates of bi- and terchloronaphthalin with potash.
- 7. Modification AE is formed, together with A and an oil, with evolution of hydrochloric acid, when bihydrochlorate of bichloronaphthalin is warmed with fuming oil of vitriol.

Chief characteristics of the Terchloronaphthalins. (Laurent, Rev. scient. 12, 213.)

	A.	AC.	C.	G.	D.	AD.
Form	6-sided prisms of 120°	6-sided prisms, rhombus of 113°	Long needles, rhombus of 113°	Prisms ter- minated by needles,rhom- bus of 130°	Like G, rhombus of 124°	Needles of eilky lustre rhombus o 122°
Hardness, &c.	Soft	Soft	Elastic, brittle	Unelastic, brittle	Like G	
Melting- point	75°	66•	Between 78° & 80°	Between 69° & 70°	Between 88° & 90°	160°
State after fusion	Soft rec- tangular parallelo- grams.	Like A	Transparent roscites, becoming slowly opaque when left to themselves.	Transparent rosettes, be- coming sud- denly opaque by friction with foreign bodics	Needles, with moirated surface transparent, becoming opaque on standing.	Transparen rosettes, becoming opaque on standing
In ether	Exceed- ingly so- luble.	Very soluble	Soluble	Solub le	Soluble	Stightly soluble
In alcohol	Very slightly soluble.	Soluble	Soluble	Soluble	Soluble	Slightly soluble

1. Modification A. 1. Chlorine gas is passed over naphthalin; and the oily hydrochlorate of chloronaphthalin (p. 39) is separated from the solid chlorides by means of ether, and again treated with chlorine, either with the aid of heat, or in the sun. A thick mixture of oily hydrochlorate of terchloronaphthalin, solid bihydrochlorate of terchloronaphthalin, and other solid chlorides is obtained. - In order to separate the products, they are mixed with ether, and the whole is maintained for several hours at 0°, whereupon the solid chlorides separate out .- (Amongst these, Laurent discovered a new chloride crystallising in right prisms with rectangular base; this form does not in any other instance occur in the series of chlorides of naphthalin, and could be isolated only by picking out the crystals with the aid of a magnifying-glass.) The oil is decanted and boiled with alcoholic potash, which is renewed two or three times. Above \(\frac{7}{8} \)-ths of the oil employed are obtained. (Laurent.) — 2. The oily hydrochlorate of terchloronaphthalin may also be subjected to distillation, whereby hydrochloric acid gas is evolved. The chloride thus prepared is, however, not pure, but must be separated from a little oil by dissolving in 3 or 4 pts. ether and 1 pt. alcohol, with the aid of heat. Crystals are obtained by the cooling of the solution, and still more by spontaneous evaporation in an open vessel. The crystals must be recrystallised once or twice from ether-alcohol, and can be obtained colourless only by recrystallisation from equal pts. of ether and alcohol, or rather more alcohol. (Laurent, Ann. Chim. Phys. 66, 197.) — 3. By treating nitro- or binitronaphthalin with chlorine, with the aid of heat. (Laurent, Ann. Chim Phys. 66, 152.) - 4. Zinin obtained terchloronaphthalin by treating chloronaphthalin (he afterwards thought that it contained the terchloronaphthalin ready formed) with oil of vitriol at 140° C., as a clear oil, which on cooling became solid like wax and floated on the brown liquid containing chlorosulphonaphthalic acid. ('This part of Zinin's research has not since been noticed; it seems to show that Zinin's compound is identical with Laurent's terchloronaphthalin A; its formation in Zinin's experiment may be explained by supposing that chloronaphthalin is converted by chlorine into compounds of the nucleus C20Cl3H5, (Carius.)

Properties. Inodorous, tastelelss. Crystallises from boiling alcohol in crystals grouped like the feather of a quill (Laurent); in long, flexible crystals of silky lustre (Zinin). It may be obtained by very slow evaporation of the ethereal solution in long, striated, irregular, six-sided prisms of 120°.—Soft like wax; the crystals soften by being pressed together, and yield a transparent mass. (Laurent, Zinin.) Melts at 75° (Laurent); at 74° (Zinin), and solidifies in crystals on cooling. Begins to boil at 200° (Zinin), and distils without decomposition. (Zinin, Laurent.)

C	rystals.				Zinin. average.	Laurent.
20 C 5 H	5	****	51·90 2·16 45·94	*******		
C20H5Cl3	231.5	***	100.00		99.09	

Since terchloronaphthalin is formed by treating the oily chloride with hydrate of potash, the latter oil must have the composition C50Cl8H5 + HCl, or + 2HCl (Laurent).

Decompositions. 1. The compound is dissolved by warm fuming sulphuric acid; water does not produce a precipitate with the solution

as long as it is warm, but on cooling it assumes a gelatinous appearance, and a crystalline body is obtained (Laurent). 2. With chlorine, aided by heat, it forms a new compound, probably C²⁰Cl⁴H⁴, HCl. (Laurent.) 3. Nitric acid is without action. (Laurent.) 4. Potassium decomposes it with evolution of light. 5. It is not attacked by aqueous potash; by alcoholic potash it is dissolved, and deposited unchanged. (Zinin.)

Terchloronaphthalin A is insoluble in water.

Ether dissolves more than its own weight of it; in alcohol, on the contrary, it dissolves but sparingly, even on boiling, and is therefore precipitated by alcohol from its ethereal solution. (Laurent.)

2. Modification AC is obtained by passing chlorine through fused bichloronaphthalin AD, whereby hydrochloric acid is evolved; it is purified by one or two recrystallisations from ether.

Properties. Fine 6-sided needles (inclination of the faces = 113°); it is soft like wax, and the crystals may be bent in all directions. (Laurent, Rev. scient. 14, 74.) Melts at 66°, and on cooling crystallises like A. Distils without decomposition.

Laurent found 51.6-8 p. c. C and 2.16 p. c. H.

Unacted upon by hydrate of potash. - Fuming sulphuric acid behaves with this modification as with A.

Dissolves more readily in alcohol than A; very soluble in ether.

3. Modification D. When bihydrochlorate of terchloronaphthalin A is distilled, it is completely decomposed; hydrochloric acid is evolved and modifications A and D of terchloronaphthalin are obtained, a small residue of carbon being left. A is first extracted from the mixture by ether; the residue is dissolved in ether with a little alcohol; and the solution allowed to evaporate spontaneously, whereupon D crystallises out. (Laurent, Rev. scient. 12, 211.)

Properties. Beautiful brilliant needles, the section of which forms a rhomb of 124°; it resembles terchloronaphthalin G. Melts between 88° and 90°, and on cooling solidifies in a transparent mass of long needles; in this state it is soft like wax, but gradually becomes hard and opaque.

Distils without decomposition.

Laurent found 51.5 p.c. C and 2.2 p.c. H.

Behaves with sulphuric acid like the other terchloronaphthalins; and is not acted upon by hydrate of potash.

Dissolves very readily in ether, much less in alcohol.

4. Modification G. If powdered crystallised bihydrochlorate of terchloronaphthalin be boiled with alcoholic potash, it is decomposed, with formation of chloride of potassium; and on adding water to the solution, a precipitate of the three modifications A, C, and G of terchloronaphthalin is produced. In order to effect their separation, the modification A is first removed with a little ether (or alcohol might first be used, which dissolves C and G more readily than A), and the residue dissolved in ether with a little alcohol. The solution is placed in a loosely covered vessel, and allowed to evaporate spontaneously. G, which is present in greater quantity than C, first crystallises; the solution is poured off from the crystals and again left to evaporate spontaneously, and this treatment is continued as long as homogeneous crystals are obtained. ment is continued as long as homogeneous crystals are obtained.

Finally G and C crystallise together; G in groups of very brilliant crystals, C in fine regular needles, which traverse the liquid in every direction. The crystals are picked out and recrystallized. (Laurent,

Rev. scient. 12, 209.)

Properties. Brilliant, colourless, transparent prisms, the section of which is a rhomb of 50 and 130°. The crystals are brittle, unelastic, and may be readily pulverised. Melts between 69° and 70° C. If one gramme of the substance be melted on a glass plate, it solidifies on cooling in a slightly transparent mass, which, by examination with the microscope, is found to consist of small striated rosettes; after a minute or so, the mass becomes perfectly opaque. If touched with a hard body immediately after solidification, it will be found to be soft, like the modification A; but as soon as it has become opaque, it is found to be brittle and easily pulverisable. If the transparent mass be touched with a feather, it suddenly becomes opaque (Laurent).

Laurent found 51.60 p. c. C, and 2.14 p. c. H. It is not decomposed either by distillation, or by potash.

Dissolves in warm fuming sulphuric acid; and on addition of water, a precipitate is formed which redissolves in warm water.

Dissolves readily in ether, less readily in alcohol.

5. Modification C is obtained mixed with G (p. 52), by boiling solid bihydrochlorate of terchloronaphthalin with alcoholic potash. It is separated from G by picking out the crystals, and purified by one or two recrystallisations from ether-alcohol.

Properties. Long, brittle, elastic needles, the section of which forms a rhomb of 113°. Melts between 78° and 80° and exhibits on cooling

the same phenomena as G.

Laurent found 51.45 p. c. C and 2.22 p. c. H.

6. Modification AD is obtained by boiling bihydrochlorate of bi- and terchloronaphthalin with alcoholic potash. The solution is precipitated by water and the precipitate treated with a little ether, whereupon the modification AD alone remains in the residue. (Laurent, Rev. scient.

Properties. Crystallises from ether in needles of silky lustre. not melt till about 160° C, and solidifies on cooling in microscopic, slightly transparent rosettes; it is then soft like wax, but gradually hardens and

becomes opaque.

It has not been analysed.

Readily soluble in alcohol, moderately in ether.

7. Modification AE. The crude oil, obtained in the preparation obihydrochlorate of terchloronaphthalin (p. 55) is treated with gently warmed fuming sulphuric acid (whereupon hydrochloric acid gas is evolved), and the brown solution is precipitated with water and left to cool. After a few hours, a brown semi-plastic mass is deposited, which is first washed with water, then with a little alcohol, and afterwards dissolved in ether. On evaporation, a deposit is formed which is a mixture of the terchloronaphthalins A, AE, and of a small quantity of an oil. Since A, as well as the oil, is more soluble in ether than AE, the product is crystallised a second time from ether, and afterwards twice recrystallised from ether-alcohol.

54 CONJUGATED COMPOUNDS OF THE CHLORINE-NUCLEUS CPCPH.

Properties. Fine, colourless needles, the section of which is a hexagon, derived from a rhomb of 122°. Melts at 93°, and on cooling crystallises like A in rectangular parallelograms, crossed by two diagonals. After cooling, it remains soft like A, but becomes hard and brittle after a time. Distils undecomposed.

						Lauren
20	C	120	5000	51.90		51-50
5	Н	5	1115	2.16		2.10
	C1		101	45.94	******	
C20C	13H3	231-5	1000	100.00		

Decompositions. 1. In contact with bromine, it evolves hydrobromic acid, and gives rise to a crystalline and almost insoluble substance.—
2. With fuming sulphuric acid it forms terehlorosulphonaphthalic acid.

It is less soluble in ether, but more soluble in alcohol than the modification A. (Laurent, Compt. rend. 21, 35; further Compt. chim. 1850, 1; extr. Ann. Pharm. 76, 300; Liebig & Kopp's Jahresb. 1850, 499.)

Conjugated compounds of the Chlorine-nucleus, C20Cl3H3.

Terchlorosulphonaphthalic Acid.

 $C^{10}Cl^{3}H^{6}S^{2}O^{6} = C^{20}Cl^{3}H^{6},2SO^{3}.$

LAURENT. Compt. rend. 21, 33; Further, Compt. chim. 1849, 390; abstr. Ann. Pharm. 72, 298; Liebig & Kopp's Jahresb. 1849, 441.

Chlorohyposulphonaphthalic acid. (Laurent.) Trichloronaphthylodithionic acid. (Kolbe.) Acide sulfonaphtalique trichloré. (Gerhardt.) Trichlornaphtalinschwefelsäure.

Formation. Obtained by treating terchloronaphthalin with fuming sulphuric acid. In preparing terchloronaphthalin AE by means of fuming sulphuric acid (p. 53) part of the terchloronaphthalin is directly converted into this acid.

Preparation. Terchloronaphthalin is dissolved in warm fuming sulphuric acid, and the solution is diluted with water and neutralised with potash, whereby an abundant gelatinous precipitate is immediately produced; the whole is then heated to boiling and filtered. On cooling, the liquid, even when very dilute, solidifies as a transparent jelly, appearing under the microscope to consist of long and exceedingly fine needles, which being interwoven give to the salt its gelatinous appearance. The salt is thrown on a filter, washed with cold water, then dissolved in boiling water and poured into a solution of acetate of lead,

whereupon a white, gelatinous precipitate, consisting of microscopic needles, is formed. If this be decomposed under water by dilute sulphuric acid, the solution filtered from sulphate of lead solidifies on cooling as a transparent jelly of terchlorosulphonaphthalic acid, consisting of microscopic needles, which, when dried and dissolved in boiling alcohol, is deposited on cooling, as a crystalline magma.

It displaces the strongest acids from their compounds, and precipitates the dilute solutions of sulphate and nitrate of potash, soda, magnesia, or oxide of nickel, as well as chloride of barium or calcium.

Ammonia-salt. Readily soluble in water and in aqueous ammonia.

Potash-salt. Opaque, microscopic laminæ; readily soluble in boiling, and almost insoluble in cold water. It is but slightly dissolved by boiling alcohol.

Baryta-salt. When a dilute, boiling solution of chloride of barium is decomposed by terchlorosulphonaphthalate of ammonia; a gelatinous precipitate, consisting of microscopic needles, is deposited from the solution on cooling. Contains 31.5 p. c. BaO,SO3 (C20Cl3BaH4,2SO3 = 30.6 p. c.) Dissolves in from 300 to 400 pts. of boiling water.

Lime-salt. The ammonia salt added to a warm dilute solution of chloride of calcium, throws down a transparent starch-like jelly.

Cuprammonium-salt. Prepared by pouring the ammonia-salt into acetate of copper, adding ammonia, and heating. On cooling, the solution solidifies in a thready jelly. The washed salt is lilac-blue, and becomes blue on drying. Its water cannot be estimated, as it parts with ammonia on drying.

Laurent found 6.3 p. c. N and 9.1 p. c. CuO; the formula CoCloCuHi,-

2SO3 + 2NH3 + 4HO requires 6.7 p.c. N and 9.5 p.c. CuO.

Hydrochlorate of Terchloronaphthalin.

C20Cl3H5, HC1.

LAURENT. Ann. Chim. Phys. 66, 109.

If chlorine-gas be passed through crude oily hydrochlorate of chloronaphthalin (p. 39), and its action promoted by warming or by sun-light, a thick oil is obtained, from which a mixture of solid chlorides is precipitated by a small quantity of ether at 0°. The decanted ethereal solution contains an oil, which Laurent supposed to be hydrochlorate of terchloronaphthalin, since it is resolved by boiling with potash or by distillation, into hydrochloric acid and terchloronaphthalin A (see also Preparation 1, p. 51).

Bihydrochlorate of Terchloronaphthalin. C²⁰Cl²H⁵,2HCl.

LAURENT, Rev. scient. 13, 78.

Chloride of Chloronaphthase. (Laurent.) Bichlorure de naphtaline chlorie. (Gerhardt.) Bichlornaphtylchlorür-Bichlorwasserstoff. (Kolbe.) Zweifach-Hydrochlor-Trichlornaphtalin.

Formation. Exists in two different modifications, which are simultaneously formed when bihydrochlorate of bichloronaphthalin is treated with chlorine-gas.

A. Solid modification. 1. Fused bihydrochlorate of bichloronaphthalin is treated with chlorine-gas. It is difficult to conduct the operation successfully, since if the temperature be too low no reaction takes place; and if too strong a heat is applied, the chloride formed is further decomposed.—2. Crude hydrochlorate of chloronaphthalin is treated with chlorine-gas. After the solid bihydrochlorate of bichloronaphthalin has been separated by ether from the buttery product of the action of chlorine on naphthalin (p. 46; preparation) and the ether expelled by heat from the oily chloride, chlorine is passed through the oil for two or three days; if the liquid thereby becomes too thick, it is gently warmed. A few drops of ether are now added, to render the mass more fluid, and it is allowed to stand in a cool place, whereupon a crystalline precipitate, exactly like C²⁰Cl²H⁶,2HCl a, is formed. The supernatant oil is decanted, and the deposit thrown on a filter, washed with a little ether, and finally dissolved in boiling ether. The solution is allowed to stand for several days in a wide-mouthed vessel covered with paper. The crystals which are then deposited on the bottom of the vessel, are sometimes a mixture of C²⁰Cl²H⁶,2HCl and C²⁰Cl²H⁵,2HCl. The crystals of the last compound being much larger than those of the first and easy to distinguish, may be readily picked out. The selected crystals are dissolved in the mother-liquor by a gentle heat, then recrystallised, again picked out, and finally recrystallised once or twice from ether.

Properties. Crystallises from ether in rhombic prisms (Fig. 68), the obtuse lateral edges being truncated; $u':u=70^{\circ}$ 15'; u':u over $t=109^{\circ}$ 45'; $t:i=115^{\circ}$ 55'; $i:u=111^{\circ}$ 25'. Sometimes several other bevelling faces occur, belonging to different acute and obtuse horizontal prisms, as well as the octahedral faces a. The crystals are transparent and colourless. Crystallised from alcohol it presents an entirely dissimilar form, viz., an oblique rhombic prism (Fig. 91); $a:a=110^{\circ}$ (about); i:u between 118° and 119; a:u = between 127° and 128°.

Melts at 105°, and when completely fused may be cooled down to 84° without becoming solid; it then crystallises slowly in nodules formed of concentric rings; the last portions remain fluid, or rather viscid, until they reach the common temperature. If the substance has been melted at 105° or 110°, and a crystal is then thrown into the liquid, it rapidly solidifies at 105° in beautiful oblique rhombic tablets. If the liquid becomes solid between 105° and 54°, a mixture of both forms is obtained, i.e., nodules and tablets, but the latter much more acute than those

eviously obtained. (Laurent.)

					aurent.
20 C	120		39.41		39.43
7 H	7	****	2.30	******	2.31
5 Cl	177.5	****	58.29		
C20Cl3H5.2HCl	304.5	-	100.00		

Decompositions. 1. Completely decomposed by distillation, evolving hydrochloric acid, yielding the terchloronaphthalins A and D, and leaving no residue.—2. Converted by boiling nitric acid into chloroxynaphthalic phthalic, and oxalic acids, together with crystalline oxychloronaphthalose.

— Converted by boiling alcoholic potash into chloride of potassium and the terchloronaphthalins A, C, and G.

Insoluble in water; slightly soluble in alcohol, rather soluble in ether (more readily than the chloride C²⁰Cl²H⁶,2HCl).

B. Liquid modification. - This is the oil obtained in the preparation of the solid modification (p. 54, 2).

7 H 5 Cl	15,2HC1	177.5	 2·30 58·29	*******	2:30
20 C	***************************************	120	 39.41		Laurent.

It is completely converted by distillation into hydrochloric acid and terchloronaphthalin A, mixed with a little oil. With boiling alcoholic potash, it yields the same products as the solid modification A.

Appendix to the Chlorine-nucleus, C20Cl3H5.

Laurent's Chlorure de Chlonaphtane.

C20Cl0.5H7.5, Cl4.

LAURENT. Rev. scient. 13, 77.

Found 1: - in crude hydrochlorate of chloronaphthalin prepared by the method described at page 39; secondly, in the ethereal mother-liquor, from which bihydrochlorate of terchloronaphthalin has been crystallised, (Comp. p. 56.)

Preparation. Crude hydrochlorate of chloronaphthalin (p. 39) left for several weeks in a cool place, deposits a white granular mixture of the chloride C²⁰Cl²H⁶,2HCl and of chlorure de chlonaphtane. The oil is decanted; the crystals are laid upon paper, until the paper no longer shows grease spots; and the product is treated with a little ether, which dissolves the last traces of oil together with all the chlorure de chlonaphtane and a small quantity of bihydrochlorate of bichloronaphthalin. Chlorure de chlonaphtane then crystallises from the solution, the oil remaining dissolved. The crystals are treated with alcohol,

which does not dissolve the bihydrochlorate of chloronaphthalin, and the crystals obtained by evaporating the alcoholic solution are purified by recrystallisation.

Properties. Crystallises in needles. Melts at 57° C, and does not solidify on cooling, but if a crystal of the chloride be added to the liquid it is immediately converted into a transparent mass of crystals.

	Λ	Teedles.				Laurent.
20 C 7.5 H 4.5 Cl		7.5 160	***	41.77 2.61 55.62	********	42·20 2·75
C20H1-	C14.5	287.5		100.00		

Decompositions. 1. Decomposed by repeated distillation into hydrochloric acid and three substances, the first of which crystallises out after the distillate has stood for a long time, and appears to be the wax-like terchloronaphthalin A. The second crystallises from alcohol in needles; the third is oily; both appear to be modifications of bichloronaphthalin and to have been formed as represented by the equation:

2. Decomposed by alcoholic potash into chloride of potassium and a sub-

stance which is perhaps C20Cl2.5H5.5.

Chlorure de chlonaphtane cannot be a mixture of the chlorides C²⁰Cl²H⁶, 2HCl and C²⁰Cl²H⁶, 2HCl, since both are much less fusible and less soluble in ether and in alcohol. (Laurent.)

Laurent's Chloride of Naphthalin and Chlonapthtise. C80H20Cl19.

LAURENT. Rev. scient. 13, 83.

Preparation. Difficult to prepare. Chlorine is passed through fused bihydrochlorate of bichloronaphthalin. If insufficient heat be applied, the substance is not attacked, and too great a heat decomposes it. action of the chlorine be too long continued, bihydrochlorate of quadrichloronaphthalin is formed. If the operation has been conducted successfully, the double chloride is obtained, mixed with bihydrochlorate of quadrichloronaphthalin and some other crystallisable and oily substances. These last are extracted by cold ether, and the residue, consisting of the two first substances, is dissolved in boiling other, and the solution allowed to evaporate spontaneously in an imperfectly closed vessel. In a few days, rhombic tablets of the double chloride and right rhombic prisms of bihydrochlorate of quadrichloronaphthalin are obtained. The first is picked out with a forceps, redissolved in ether, allowed to crystallise, and the rhombic tablets are again picked out. These are finally dissolved in boiling alcehol and crystallised by cooling the solution.

Crystals: fig. 86 without the faces m and f; i:h behind = 120° (about); u:h below = 130° (about); i:u = about 110°; and accord-

ingly it has the same form as bihydrochlorate of bichloronaphthalin a. Melts at 160°. (Laurent.)

	2	Cablets.				Laurent.	
	80 C 29 H 19 Cl	29	****	40·55 2:46 56·99	*******	40·52 2·50	
Ī	CsoH29Cl19	1183.5		100.00			ī

Hence it has the composition of a compound of 3 At. bihydrochlorate of terchloronaphthalin = C²⁰H²Cl¹⁵, and 1 At. bihydrochlorate of bichloronaphthalin = C²⁰H²Cl¹⁵.

— It is not a mixture, since on distillation, it yields terchloronaphthalin A, and an oil, together with hydrochloric acid gas. Boiled with alcoholic potash, it parts with 2 At. hydrochloric acid, and yields microscopic needles, which are not obtained from a mixture of the two chlorides. Its melting point is also higher than that of either chloride. (Laurent.)

Chlorine-nucleus C20Cl4H4.

Quadrichloronaphthalin, CooCl4H4.

LAURENT. Ann. Chim. Phys. 59, 196; Further, Ann. Chim. Phys. 66, 203; Further, Rev. scient. 12, 218.

Tetrachloronaphtaline, Chloronaphtalose, Chlonaphtose. (Laurent.) Dekaletryl-chlorid. (Berzelius.) Chloride of terchloronaphthyl. (Kolbe.) Naphtaline quadrichlorée. (Gerhardt.)

Formation. Exists, according to Laurent, in four different modifications. A, B, E, and K, which are formed in different ways.

Chief characteristics of the Quadrichloronaphthalins. (Laurent, Rev. scient. 12, 221.)

-	A.	В.	E.	K.	
Elasticity	Soft	Brittle	Flexible	Flexible	
Form.	6-sided prisms of 120°	Oblique prisms with oblique base of 100°, 101°, 103°	Long needles, rhombus of 94°	Short needles, rhombus of 100	
Melting-point	106°	1240	170°	125°	
Crystalline form after fusion	Microscopic rosettes	Needles	Needles	Rosettes	
In ether	Very soluble	Very slightly soluble	Very slightly soluble	Very slightly soluble	

^{1.} Modification A. Formed when naphthalin, or one of the first products thereof by the action of chlorine, is heated to boiling and treated with chlorine-gas.

Preparation. Chlorine is passed through fused terchloronaphthalin A. — 2. (Very advantageous.) Chlorine is passed through impure hydrochlorate of chloronaphthalin, until the mass, which has been kept fused, solidifies when slightly cooled, and the white crystalline product, which generally contains an admixture of oil, is recrystallised two or three times from boiling alcohol. Thus prepared it sometimes still contains perchloronaphthalese, which may be easily recognised by its crystalline form. — 3. On distilling bihydrochlorate of quadrichloronaphthalin, hydrochloric acid is evolved and a mixture of quadrichloronaphthalin A and B passes over, from which

A is extracted by ether.

Properties. Long, white or yellowish needles. Crystallises in 6-sided prisms of 120°; the crystals are very like those of terchloronaphthalin A, but are more brilliant, and are not terminated by needles, but generally rounded at the angles; almost all the crystals have an opening parallel to the axis. Melts at 106°, and on cooling solidifies in microscopic rosettes. Soft like wax and plastic. It sublimes at higher temperature

unchanged in small needles.

				3	Laurent.
20 C 4 H 4 Cl	4	****	1.51		44·5 1·5
C20Cl4H4	266	****	100.00		

Decompositions. 1. Heated on a combustible body, it burns with a green-edged, smoky flame. - 2. With chlorine at a gentle heat it forms hexachloronaphthalin. 3. It is not attacked by boiling acids. 4. Converted by fuming sulphuric acid into quadrichlorosulphonaphthalic acid.

— 5. When it is heated with potassium, light is evolved and carbon deposited. — 6. Not decomposed by boiling alcoholic potash. It may be melted and volatilised on fragments of potash, without undergoing decomposition. If its vapour be passed over lime heated nearly to redness, carbon is deposited and chloride of calcium formed.

Combinations. Very slightly soluble in boiling alcohol. It requires

four or five times as much ether for its solution as terchloronaphthalin.

2. Modification B. (Preparation, vid. sup.)

Properties. Highly lustrous prisms of the doubly oblique prismatic system. Fig. 124, without z-faces; $y: u = 100^\circ$; $y: v = 101^\circ$ 30'; $v: u = 103^\circ$. Melts about 125°, and solidifies in beautiful needles on cooling. Distils without decomposition.

Laurent found 45.00 p.c. C and 1.50 p.e. H.

It is not attacked by potash. Dissolves very slightly in ether, less than A.

3. Modification E. (Parachloronaphtalose. Laurent.)

Formation. By distilling bihydrochlorate of quadrichloronaphthalin X, hydrochloric acid being evolved; or by boiling the same substance with alcoholic potash.

Preparation. Oily bichloronaphthalin A (p. 41) is cooled in order to free it from the accompanying solid modifications, and chlorine is passed through it in the cold for a long time (whereupon it acquires the consist-

ence of honey); it is then warmed and treated with more chlorine. The product, after standing for 4 days, does not yield a deposit, but when shaken with half of its volume of ether, it gives a white pulverulent precipitate. It is the crystallised modification of Cooch4H4,2HCl, since the oil contained a little bichloronaphthalin C. When the ethereal liquid is evaporated, and the residual X-Cooch4H4,2HCl, boiled with alcoholic potash, which is renewed four or five times, it yields a crystalline substance, contaminated with a brown oil. The same product is likewise formed when the chloride is distilled. To separate the crystals from the oil, they are pressed between blotting paper and boiled with ether-alcohol. The product is finally distilled.

Properties. Crystallises from ether or rock-oil in microscopic silky needles. Melts at 170°, and solidifies in a radiated mass. Distils without decomposition. Inodorous.

N	eedles				Laurent
20 C 4 H 4 Cl	4	****	45·12 1·51 53·37	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	45·79 1·65
C20Cl4H4	266		100.00		

It is not attacked by potash.

It is but very slightly soluble in boiling alcohol, and not much more in warm ether; the accompanying brown oil considerably increases its solubility.

At the ordinary temperatures, it is almost insoluble in rock-oil, but readily soluble at the boiling point; on cooling, the solution becomes completely filled with long needles.

4. Modification K. Crystallised bihydrochlorate of quadrichloronaphthalin C is boiled with alcoholic potash as long as chloride of potassium is formed; the whole is then diluted with water, the residue washed with alcohol or with ether, and dissolved in boiling ether or rock-oil. The solution deposits crystals on cooling.

Properties. Very fine and short needles, forming nodular groups; their section is a rhombus of 100° + 80°. Melts at 125°, and on cooling

solidifies in an opaque mass. Distils without decomposition.

Laurent found 44'90 p. c. C and 1'50 p. c. H.

It is not attacked by potash. Dissolves very sparingly in alcohol and in boiling ether, likewise in cold rock-oil, but to a greater amount in boiling rock-oil. The solution in rock-oil deposits on cooling nodular grouped needles, which occupy but a very small portion of the liquid.

Appendix to Quadrichloronaphthalin.

Chloronaphtone F. C20H4-5Cl3-5.

LAURENT. Rev. scient. 12, 215.

Formation & Preparation. By passing chlorine through fused bichloronaph-thalin F, hydrochloric acid being evolved; purified by recrystallization from boiling alcohol.

Colourless laminæ. It is the only radical without definite form. After fusion, it solidifies in a scaly mass. Distils without decomposition.

Laurent found 48.0 p. c. C, and 2.0 p. c. H; by calculation, 48.3 p. c. C, and

It is possibly an isomorphous mixture of the unknown modifications F, of bi- and terchloronaphthalin. (Laurent.) Somewhat readily soluble in alcohol, very soluble

Conjugated compound of the Chlorine-nucleus, CoCloH.

Quadrichlorosulphonaphthalic Acid. $C^{20}H^4Cl^4S^2O^6 = C^{20}Cl^4H^4, 2SO^5.$

LAURENT. Compt. rend. 21, 33; further, Compt. chim. 1849, 397; abstr. Ann, Pharm. 72, 300; Liebig & Kopp's Jahresb. 1849, 442.

Quadrichloronaphthylodithionic acid. Acide sulfonaphtalique quadrichloré. (Gethardt.) Quadrichlornaphtalinschwefelsäure.

Known only in combination with potash.

Formation and Preparation. Produced by heating quadrichloro-naphthalin with fuming sulphuric acid. When the whole is completely dissolved, the liquid is diluted with water, neutralised with potash, heated dissolved, the riquid is diffitted with water, neutralised with potash, neated to boiling, and rapidly filtered. On cooling, the potash-salt is deposited in crystalline flakes, which are washed on a filter and dried. These contain 22.0 p. c. KO, SO3, corresponding to the formula Coold kH3,2SO3 which requires 22.6 p. c. KO,SO3. Almost insoluble in cold and only slightly soluble in hot water; readily soluble in boiling alcohol.

The alcoholic solution of the potash-salt does not precipitate acctate.

of baryta; but the liquid is rendered gelatinous by the addition of

water.

Bihydrochlorate of Quadrichloronaphthalin. $C^{20}H^6Cl^6 = C^{20}H^4Cl^4, 2HCl.$

LAURENT. N. Ann. Chim. Phys. 59, 196; 66, 196 and 203; further (complete description of the three modifications), Rev. scient. 13, 85.

Perchloronaphtalise, Chlorure de chlonaphtèse. (Laurent.) Dekahexylsuper-chlorid. (Berzelius.) Trichlornaphtylchlorur-Bichlorwasserstoff. (Kolbe.) Bichlorure de naphtaline bichlorée. (Gerhardt.) Zweifach-Hydrochlor-Quadrichlornaphtalin.

Formation. Produced by treating bichloronaphthalin with chlorine, and in three different modifications, according as the modifications C, A, or X are employed.

1. Modification C. 1. Bichloronaphthalin C is kept in fusion and treated with chlorine; no hydrochloric acid is evolved. The product is purified by washing with a little ether, dissolving in boiling ether, and crystallising.—2. Chlorine is passed through the crude mixture of bichloronaphthalin obtained by distilling C²⁰Cl²H⁶,2HCl (p. 42); the thick transparent product is diluted with a little ether; and the white crystalline powder, which is deposited after a few minutes, is recrystal-lized from boiling alcohol.

Properties. Crystallises from ether on cooling, or better by slow evaporation, in small, brilliant, oblique, rhombic prisms: fig. 99, with faces m and without i; u': u = between 90° and 91°; x: x = between 122° and 123°; x: u = between 128° and 129°. Colourless, inodorous. Melts at 141°; and after complete fusion, solidifies in near n bishes. only partly melted, it crystallises in prisms, and apparently at a higher temperature.

P	risms		Laurent.	
20 C	6	 1.77		
C®Cl4H4,2HCl	339	 100-00		ľ

Decompositions. 1. By distillation, it evolves hydrochloric acid and yields a small quantity of quadrichloronaphthalin A, and much B .-2. With boiling alcoholic potash it forms chloride of potassium and quadrichloronaphthalin K. — 3. Potassium decomposes it at a gentle heat, with evolution of light and deposition of carbon.

Slightly soluble in ether, still less in alcohol.

2. Modification A. Bichlorenaphthalin A is treated with chlorine, whereupon only a very small quantity of hydrochloric acid is evolved,

Properties. Oily liquid.

On distillation it evolves hydrochloric acid and yields quadrichloronaphthalin A, together with traces of an oil. Boiled with alcoholic potash, it is resolved into chloride of potassium and quadrichloronaphthalin A.

3. Modification X. Bichloronaphthalin X is treated with chlorine, whereupon no appreciable quantity of hydrochloric acid is evolved. The oil becomes very viscid, owing to the formation of small quantities of modification C, which are separated by shaking up the liquid with a small quantity of other. The ethereal solution is evaporated.

Properties. Oily liquid.
On distillation, it evolves hydrochloric acid and yields quadrichloronaphthalin E: the same products are obtained with alcoholic potash.

Chlorine-nucleus C20Cl6H2.

Sexchloronaphthalin. C20Cl6H2.

LAURENT. Rev. scient. 12, 233; further, Compt. rend. 16, 861.

Chlonaphtalase A. (Laurent.) Chloride of quintichloronaphthyl. (Kolbe.) Sechsfach-Chlornaphtalin.

Formation and Preparation. Terchloronaphthalin A is treated with chlorine for a long time at an elevated temperature. If the product contains perchloronaphthalin, it is extracted with ether, wherein the last substance is but sparingly soluble.

Properties. Six-sided prisms with angles of 120°. Soft like wax and may be bent in every direction. Melts and solidifies at 143°. Distils without decomposition.

1	rism	8.			Laurent.
20 C 2 H 6 Cl	2	****	35·88 0·60 63·52	********	36·00 0·66
C20Cl6H2	335	****	100.00		

Decompositions. It is not attacked by potash, or by dilute sulphuric or hydrochloric acid. It is dissolved sparingly by warm oil of vitriol. — Boiling nitric acid converts it slowly into oxide of chloroxynaphthalise, C²⁰Cl⁶O².O². (Laurent.)

C²⁰Cl⁶O²,O². (Laurent.)
Soluble in about 20 pts. ether; dissolves more abundantly in rock-oil, scarcely at all in alcohol.

Appendix to Sexchloronaphthalin.

Chlonaphthalane A. C20Cl5.5H2.5.

LAURENT. Rev. scient. 12, 232.

Formation and Preparation. On treating bichlorousphthalin C with chlorine, aided by a gentle heat, a mixture of sexchloronaphthalin A and of chlonaphthalane A is obtained, which is separated by crystalisation from its solution in ether mixed with a little alcohol. By spontaneous evaporation, fine needles of sexchloronaphthalin crystallise out, then fine as well as thicker needles. The liquid is then decanted, and chloronaphthalane is obtained on further evaporation.

Properties. Six-sided prisms of 120°, pierced parallel to the axis. Slightly yellow, and soft like wax. After melting, it crystallises at 131° C in microscopic rosettes. Volatile without decomposition; not decomposed by hydrate of potash.

Laurent found 37.53 p. c. C, and 0.83 p. c. H; calculation, 37.7 p. c.

C and 0.8 p. c. H.

Dissolves in ether, but less freely than quadrichloronaphthalin A; scarcely soluble in alcohol.

Chlorine-nucleus C20C18.

Perchloronaphthalin. CoCla.

LAURENT. Rev. scient. 12, 234.

Chloronaphtalis A. (Laurent.) Chloride of perchloronaphthyl. (Kolbe.)
Naphtaline perchlorée. (Gerhardt.)

Formation and Preparation. Chlorine is allowed to act for a long time upon terchloronaphthalin A kept in fusion. The sexchloronaphthalin is

removed from the product by means of ether, and the residue is treated with boiling rock-oil.

Properties. Light yellow, easily friable, acicular prisms with angles of 112° 30′ and 67° 30′. Melts at 172°; volatile without decomposition.

	Prism	9.		Laurent.	
20 C 8 Cl			29·75 70·25	 29.88	
C20Cl8	404		100.00		

Laurent obtained in his analysis 0.06 p. c. H, in addition.

The compound is not attacked by potash. Very slightly soluble in boiling alcohol and ether.

Oxychlorine-nucleus C20C1H5O2.

Chloronaphthalic Acid. C20ClH8O3 = C20ClH8O3,O4.

LAURENT. Compt. rend. 16, 861; Ann. Chim. Phys. 74, 26; Rev. scient.
 13, 592; abstr. Ann. Pharm. 35, 292.
 WOLFF & STRECKER. Ann. Pharm. 75, 14.

Acide chloronaphtisique. (Laurent.) Acide chloroxynaphtalique. (Gerhardt.)

Formation. By boiling hydrochlorate of terchloronaphthalin with nitric acid; Laurent afterwards obtained only chloride of chloroxynaphthalin, and therefore thought it probable that the acid was formed from this substance when the two bodies were separated by very dilute alcoholic potash.

2. By boiling chloroxynaphthalin with concentrated alcoholic

potash:

C20Cl2H4O4 + KO,HO = C20ClH5O6 + KCl.

Preparation. Bihydrochlorate of terchloronaphthalin (Laurent) is boiled with nitric acid, till a yellow oil, which becomes very thick on cooling, is formed. This is mixed with ether, whereupon a yellow substance (chloride of chloroxynaphthalin with or without chloronaphthalic acid) is precipitated; on boiling the latter with alcoholic potash, it dissolves completely. The liquid is diluted with a small quantity of water and neutralised with an acid, whereupon chloronaphthalic acid gradually crystallises out on cooling. (Laurent.) — Wolff & Strecker once obtained by this method an acid, which did not yield the common golden-yellow baryta-salt, but a purple-red salt, perhaps bi- or terchloronaphthalic acid. (Wolff & Strecker.)

Properties. Long, yellow, transparent, inodorous, very delicate needles, permanent in the air; their ends show under the microscope re-entering angles, because they consist of two twin crystals. Sometimes short irregular crystals are met with, which, however, also show the reentering angle. Melts about 200° C., and on cooling crystallises in lamine, which, being composed of rectangular prisms, likewise exhibit a re-entering angle at their ends. Distils without decomposition. (Laurent.)

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at 100° in vacuo. mean. 57.00 120 57.6 35.5 ******* 2·4 16·8 ... ****** 16.68 ******* 48 23.2 23.87 C20C1H5O6 208.5 100.0 100.00

This compound is alizarin, in which 1 At. H is replaced by 1 At. Cl, as is evident from the analogy between the two substances, in composition, properties and decomposition-products, especially with nitric acid. (Wolff & Strecker.)

Decompositions. Resolved by boiling nitric acid into phthalic, exalic, and hydrochloric acids (unless perhaps a chlorophthalic acid, C¹⁶ClH²O², is formed: Wolff & Strecker):

2. Chloronaphthalic acid cannot be reduced to alizaric acid either by Melsens' method (reduction by potassium-amalgam, ix, 211), or by that of Kolbe (reduction in the voltaic circuit, vii, 295). The aqueous acid produces with potassium-amalgam the dark red solution of the potash-salt, which does not appear blue by reflected light; only a small quantity of the acid is decomposed in this reaction. The potash solution of the acid becomes light in the electric current. (Wolff & Strecker.)

Combinations. It does not dissolve appreciably in water.

Dissolves in strong sulphuric acid, and is precipitated therefrom by water.

With Bases. — Chloronaphthalates. The acid forms very beautiful salts, varying between yellow, orange, and carmine-red. A piece of paper saturated with the aqueous solution of the acid, is immediately turned red by ammonia-vapour. The salts yield by distillation a new crystalline substance, and leave a residue of metallic chloride and charcoal. — Hydrochloric acid precipitates the acid from them. — They are almost insoluble in water, and are, with the exception of the potash-salt, obtained by double decomposition from the solution of the ammonia-salt in 30 pts. water.

Chloronaphthalate of Ammonia. The acid is added to a hot dilute solution of ammonia in alcohol or water, whereupon the salt crystallises on cooling in radiated crimson needles. By distillation it yields much carbon and a white sublimate. (Laurent.)

Chloronaphthalate of Potash. Hydrate of potash is heated to boiling with 10 or 15 pts. water or alcohol, and the acid is added till the alkali is saturated. Crystallises on cooling in striated carmine-coloured needles, which must be washed with a little alcohol. Dried at 100° in vacue, it contains 18.07 p. c. KO, corresponding to the formula C***CIKH**O** + Aq. Calculation = 18.46 p. c. KO. (Laurent.)

Chloronaphthalate of Baryta. Chloride of barium precipitates from the ammonia-salt (when dilute, after a short time) very friable silky needles, which are orange-coloured when dry, and become red under the burnisher. Dried in vacuo at 100°, it contains 27.27 p. c. BaO, corresponding to C²⁰ClBaH⁴O°. (Laurent.) (By calculation = 27.7 p. c. BaO.)

Chloride of Strontium precipitates orange-yellow needles.

Chloronaphthalate of Lime. When chloride of calcium is added to a solution of the ammonia-salt, the liquid after a few minutes becomes filled with long overage vellow needles.

filled with long orange-yellow needles.

The ammonia-salt immediately yields with potash-alum an orange-yellow precipitate; with sulphate of cadmium, an instantaneous brilliant vermilion-red precipitate, which under the microscope is seen to consist

of yellow cruciform crystals.

With acetate of lead, it forms an orange-yellow precipitate. The solution of the acid in boiling alcohol, forms with alcoholic acetate of lead, beautiful, silky, orange-coloured, four-sided needles. It precipitates subacetate of lead, orange-red; ferrous and ferric sulphates, brown; with chloride of cobalt it produces an instantaneous crimson-red precipitate, which is blood-red after drying, and then becomes vermilion-red under the burnisher. It yields a crystalline carmine-coloured precipitate with cupric acetate; with mercuric chloride a reddish-brown; and with nitrate of silver a blood-red precipitate, which is dense when precipitated from hot solutions, and, when examined with the microscope, is found to consist of carmine-red needles.

Chloronaphthalic dissolved with difficulty in boiling alcohol and in ether. It does not dye fabrics either mordanted with alumina or oiled

and mordanted for Turkish-red. (Wolff & Strecker.)

Appendix to Chloronaphthalic Acid.

1. Peculiar acid obtained from Bihydrochlorate of Terchloronaphthalin by the action of Nitric Acid.

LAURENT. Ann. Chim. Phys. 74, 26.

Formation and Preparation. Formed by boiling the oily modification of bihydrochlorate of terchloronaphthalin for two or three days with 6 pts. concentrated nitric acid. The acid liquid is separated from the oil, then evaporated, and the phthalic acid, which now crystallises out, is separated from the solution, which is further evaporated till the residue solidifies in a crystalline mass. This neutralised with aqueous ammonia, evaporated to dryness, taken up with boiling water, filtered from a brown, viscid substance, and again evaporated, leaves a residue, which, being dissolved in boiling alcohol, deposits after 24 hours a very small quantity of a sparingly soluble, scarcely crystalline salt, which has not been further investigated. The remaining solution is precipitated by chloride of calcium, the precipitate after standing 24 hours, thrown on a filter, washed with a little cold water, then heated to boiling with 20 pts. water, whereby only a part is dissolved, and oxalic acid is gradually added till the salt is almost completely decomposed. The liquid is then

F 2

filtered and evaporated, whereupon it separates into an aqueous and an oily stratum; the latter, on being dissolved in ether, filtered from a slight residue, and evaporated, yields a peculiar oily acid.

Yields by distillation a substance which crystallises on cooling, is insoluble in water, but soluble in ammonia.

The acid dissolves in water, and separates by evaporation as an oily stratum.

Forms crystallisable salts with ammonia, potash, and lime.

2. Oxychloronaphthalenose. C18H8C16O2 \$

LAURENT. Ann. Chim. Phys. 74, 26.

Formation and Preparation. In the preparation of chloride of chloroxynaphthalin with nitric acid from oily bihydrochlorate of terchloronaphthalin. The ethereal solution, filtered from the chloride of chloroxynaphthalin (q. v.), deposits by spontaneous evaporation, small colourless prisms and a yellowish substance. The oil is decanted (it is almost completely converted by distillation into terchloronaphthalin), and the crystals are washed with a little ether, then with alcoholic potash, and dissolved in boiling alcohol. On cooling, oxychloronaphthalenose crystallises from the solution. thalenose crystallises from the solution.

Properties. Oblique rhombic prisms or needles, colourless, and very brilliant. Melts about 160°, and distils at a higher temperature apparently without decomposition.

					Laurent.
18 C	108	****	31.30	*********	31.00
8 H	8	****	2.32		2 22
6 Cl	213		61.73	-	61.07
20	16	****	4.65	*******	5.71
C18H8C16O2	345		100.00		100.00

Insoluble in water. - Dissolves in strong sulphuric acid without coloration, slightly in alcohol and in ether.

Oxychlorine-nucleus CoCl2H4O2.

Chloride of Chloroxynaphthalin. $C^{20}Cl^{9}H^{4}O^{4} = C^{20}Cl^{9}H^{4}O^{9}, O^{2}.$

LAURENT. Compt. rend. 16, 861; Ann. Chim. Phys. 74, 26; Rev. scient. 13, 592; abstr. Ann. Pharm. 35, 299.

Oxychloronaphtalose, Oxide of Chloroxenaphtose. (Laurent.) Chlorure de chloroxynaphtyte. (Gerhardt.)

Formation. By boiling bihydrochlorate of terchloronaphthalin with nitric acid. (Laurent.)

Preparation. Crystalline bihydrochlorate of terchloronaphthalin is boiled with nitric acid, till a yellow oil, becoming very viscid on cooling, has been formed. (Phthalic acid crystallises from the acid solution on evaporation.) The oil mixed with a small quantity of ether, yields a pulverulent deposit, which, after standing for one or two days, is purified by decantation and washing with ether on a filter, and then dissolved in a large quantity of boiling alcohol. On cooling, needles of chloride of chloroxynaphthalin are deposited from the solution:

In the first preparation, Laurent obtained the chloride of chloroxy-naphthalin mixed with chloronaphthalic acid, bihydrochlorate of quadrichloronaphthalin and another crystalline substance; afterwards (Rev. scient. 13, 592) he obtained only the above-mentioned oil, which contains only chloride of chloroxynaphthalin, but in a very small quantity.

Properties. Brilliant, yellow needles, bent like the knee. Melts at 98°; and sublimes at a higher temperature, without decomposition, in rhombic tablets.

					Laurent
20 C	120	****	52.87		53.3
4 H	4		1.76	*******	1.8
2 Cl	71	****	31.27		30.7
40	32	****	14.10		14.2

Laurent found previously 56.04 p. c. C, and 2.54 p. c. H.

Decompositions. Blackens on exposure to light.—2. Converted by boiling nitric acid into phthalic acid.—3. It is instantaneously turned carmine-red by alcoholic potash; the whole then dissolves in water as chloride of potassium and chloronaphthalate of potash.

Combinations. Insoluble in water. Dissolves in oil of vitriol with mahogany colour, and is precipitated therefrom by water in its original state.

Dissolves very slightly in alcohol or in ether.

Oxychlorine-nucleus C20Cl5HO2.

Perchloronaphthalic Acid. C²⁰Cl⁵HO⁶ = C²⁰Cl⁵HO²,O⁴.

LAURENT. Compt. rend. 16, 861; Rev. scient. 13, 596.

Chloroxenaphthalesic acid. (Laurent.) Acide perchloroxynaphtalique. (Gerhardt.)

Formation and Preparation. When chloride of perchloroxynaphthalin is treated with potash, a very beautiful carmine-red substance is instantaneously formed, from which perchloronaphthalic acid separates on the addition of an acid:

The product is purified by dissolving it in ether, evaporating the solution, dissolving the crystalline deposit in alcohol, and adding potash, whereby a precipitate of carmine-red needles is immediately formed. These being collected on a filter, washed and decomposed by an acid, yield perchloronaphthalic acid, which may be finally recrystallised from alcohol or from ether.

Properties. Yellow, crystalline.

Laurent.	L						
35.0		34.6	****	120	***************************************	C	20
0.5	mann	0.3	NIA	1		H	
50.5		51.2	****	177.5	***************************************	Cl	5
		13.9	****	48		0	6
	-	100.0	***	346.5	НО8		-

Hence it is formed from chloride of perchloroxynaphthalin, in the same manner as chloronaphthalic acid from chloride of chloroxynaphthalin. (Laurent.)

Combinations. When added to boiling alcoholic solution of potash or ammonia, it forms red or carmine crystalline salts, which appear to dissolve to a slight extent only in boiling water.

Oxychlorine-nucleus C20C16O2.

Chloride of Perchloroxynaphthalin.

 $C^{20}Cl^6O^4 = C^{20}Cl^6O^2,O^2.$

LAURENT. Compt. rend. 16, 861; Ann. Chim. Phys. 74, 26; Rev. scient. 13, 595; abstr. Ann. Pharm. 35, 292.

Chloroxenaphtalisoxyd (Laurent); Chlorure de Perchloroxynaphtyle (Gerhardt).

Formation. Formed by boiling sexchloronaphthalin with nitric acid, (together with chloropthalic acid, which remains in the acid solution, also an oil, and a crystalline substance, neither of which have been further investigated):

Preparation. Sexchloronaphthalin is but feebly attacked by nitric acid, 10 grammes thereof require boiling for 3 or 4 days, whereby a yellow resin, melting in the boiling nitric acid, is formed. The whole is diluted with a little water, boiled, and decanted. The resin is palverised, and after the oil has been extracted by digestion with ether, the residue is dissolved in boiling rock-oil, from which the chloride of perchloronaphthalin is deposited a few degrees below the boiling point, and again recrystallised from rock-oil.

The rock-oil solution, when perfectly cool, deposits a second substance, which appears under the microscope to consist of orange-coloured granules, and, according to Laurent, is gradually decomposed by boiling rock-oil, which thereby acquires a brown colour.

Properties. Crystallises from boiling ether or from rock-oil in light, yellow, highly brilliant laminæ. It melts at a rather elevated temperature, and then volatilises, for the most part undecomposed.

					Laurent.
20 C	 120	****	33.0	horses	33.3
6 Cl	 213	5	58.2		56.7
40	 32	****	8.8	imini.	10.0
CanCle O4	 365		100.0	iman	100.0

Decompositions. 1. Converted by boiling nitric acid, probably into chlorophthalic acid. 2. With potash or ammonia it forms a chloride of the metal and perchloronaphthalic acid.

Insoluble in water and in alcohol; very slightly soluble in boiling

ether, sparingly in boiling rock-oil.

Bromochlorine-nucleus C20 BrC1H6.

Hydrochlorate of Chlorobromonaphthalin. C**OH**BrCl** = C**OBrClH**, HCl.

C'h bier = C'brein', ne

LAURENT. Rev. scient. 13, 580.

Subchloride of Bronaphthase. (Laurent.) Chlorure de naphtaline bromée. (Gerhardt.) Hydrochlor-Chlorbromnaphtalin.

Formation and Preparation. When chlorine is passed into crude bromonaphthalin, the liquid gradually thickens, and deposits a crystalline substance. The product is diluted with a small quantity of ether, and allowed to stand for 24 hours; the oil is then decanted, and the crystalline powder is washed with ether and dissolved in a large quantity of boiling ether, whereupon it crystallises by spontaneous evaporation.

Properties. Rhombic tables, derived from an oblique rhombic prism, resembling bihydrochlorate of bichloronaphthalin. (Fig. 81.) Tabular, owing to the predominance of the i-face; u': i = between 121° and 122°. Melts at 165°, and on cooling crystallises in well-defined rhombic tables.

7	ables	9		1	Laurent.
20 C	7 80	****	28.8		43·0 2·6
C20BrClH6,HCl	278	****	100.0		

By distillation it evolves bromine and a hydracid.

Bihydrochlorate of Bromochloronaphthalin.

C²⁰H⁴BrCi³ = C²⁰BrClH⁶,2HCl.

J.AURENT. Compt. rend. 21, 25; Compt. chim. 1850, 1; abstr. Ann. Pharm. 76, 399; Liebig & Kopp's Jahresb. 1850, 498.

Bicklorobromure de nep tialine (Gerhardt).

Formation and Preparation. Bromine is poured over bibydrochlorate of bichloronaphthalin β , and the liquid is left to stand in a closed flask for 48 hours; the excess of bromine and the undecomposed chloride are then removed by lukewarm alcohol, and the residue is dissolved in boiling ether, from which the new product crystallises on cooling.

Properties. Colourless four or eight-sided rhombic prisms, the acute lateral edges of which are generally truncated by irregular faces (Fig. 81), $i: u = 103^{\circ} 30^{\circ}$; $u': u' = about 103^{\circ}$; hence it is isomorphous with bihydrochlorate of bichloronaphthalin β . (Laurent.)

20 C	120				
		• • • •	38.50	****	38·06
8 H	8	****	2.22	*******	2.56
Br	80		25.47		
3 Cl	106.2	••••	33.78		

It is decomposed by alcoholic potash, as well as by distillation.

Dissolves more readily in ether than common bihydrochlorate of bichloronaphthalin a, and less readily than the modification β of the same chloride.

Bromochlorine-nucleus C20BrCl2H5.

Bromobichloronaphthalin. C™BrCl³H*.

LAURENT. Rev. scient. 12, 214.

Chlorbronaphtise A (Laurent). Naphtaline bromobichlorée (Gerhardt). Chloride of chlorobromonaphthyl (Kolbe).

Formation and Preparation. A slight excess of bromine is poured over bichloronaphthalin AD, and the whole is allowed to stand for one or two days in an imperfectly closed vessel, whereupon hydrobromic acid is evolved. The excess of bromine is first removed by washing the product with a small quantity of alcohol and a little ammonia, and the residue is then dissolved in boiling alcohol. The compound crystallises on cooling, while any bichloronaphthalin that may be present remains in the alcoholic mother-liquor.

Pr. parties. Colourless; of the consistence of wax. Crystallises from alcohol in fine needles, and by spontaneous evaporation of its ethereal

solution, in six-sided needles, with angles between 120° and 121°. Melts at about 80°, and on cooling solidifies in rectangular parallelograms, crossed by diagonals. When it is perfectly cold, the surface of the mass has a moiréd appearance. It distils without decomposition.

				1	Laurent.	t.
20 C	120	****	43.5		44.5	
5 H	5	****	1.8		1.9	
Br	80	****	29.0			
2 Cl	71	****	25.7			
C20BrCl2H5	276		100.0			

Unattacked by potash. Sparingly soluble in alcohol; readily in ether.

Appendix to the Bromochlorine-nucleus C20BrCl2H5.

Laurent's Chlorébronaphtine.

C20H5.5Br0.5Cl2.

LAURENT. Rev. scient. 12, 205.

Formation and Preparation. Bichloronaphthalin X is treated with bromine, and the resulting oily bromide is boiled with alcoholic potash (whereby bromide of potassium is formed), and the oily product, which speedily solidifies, is precipitated by water. The mass still contains an oil, from which it may be freed by pressing between paper and repeated recrystallisation from ether-alcohol.

Properties. Colourless needles. Melts at 47°, and solidifies in rectangular parallelograms crossed by two diagonals bristling with needles. Volatile without decomposition. It is not attacked by potash.

Laurent found 51.1 p. c. C. and 2.3 p. c. H.; by calculation, 51.0 p. c. C. and

2:3 p. c. H.

It is not a mixture of the radicals C²⁰Cl²H⁵ and C²⁰BrCl²H⁵, first, because the bichloronaphthalin could only be the modification X, which is liquid; secondly, because other compounds corresponding to this chloride exist, which are not mixtures. (Laurent.)

Bromochlorine-nucleus C20Br3ClH4.

Bihydrobromate of Terbromochloronaphthalin.

CoBroClHo = CoBroClH4,2 HBr.

LAURENT. Rev. scient. 13, 92; further, Compt. chim. 1850, 8.

Bromure de chlorobronaphièse (Laurent). Bibromure de naphialine bromo-chlorée (Gerhardt).

Formation and Preparation. The first distillate of chloronaphthalin is treated with bromine. A lively effervescence then ensues, owing to evolution of hydrobromic acid, and with excess of bromine, crystals are formed on standing. These are dissolved in a very large quantity of boiling ether, which on cooling deposits very small, highly brilliant prisms of the compound.

Properties. Prisms belonging to the doubly oblique prismatic system. Fig. 132, without u- and x-faces; with q-faces; $w:v=96^\circ$; $y:w=85^\circ$; $y:v=102^\circ30'$; $v:e=125^\circ$; $y:e=135^\circ$; $w:e=124^\circ$; $e:q=114^\circ$; $v':q=121^\circ$; $w:q=120^\circ$; $v:q=136^\circ$. (Laurent, Compt. chim. 1850, 8; corrected description.)

	Prisms.			Laurent.
20 C	6 35·5		21·38 1·07 6·33 71·22	 21.87
C20Br3ClH4,2HBr	561.5	500	100.00	

It turns red before melting; evolves bromine vapour at 100°; melts about 110°, and then evolves a large quantity of bromine and hydrobromic acid, leaving an oil which on cooling crystallises in quadrilateral figures, crossed by two diagonals bristling with needles (as is the case with terchloronaphthalin).

Bromochlorine-nucleus C20Br2Cl2H4.

Bibromobichloronaphthalin.

C20Br2Cl2H4.

LAURENT. Rev. scient. 12, 222; further, Compt. rend. 14, 380.

Formation. It exists, according to Laurent, in two isomeric modifications; modification a (chlorebronaphtose b, Laurent) obtained by the action of bromine upon bichloronaphthalin, and modification β (bromechlonaphtose b, Laurent), by the action of chlorine on bibromonaphthalin.

 Modification a. Bromine is poured over bichloronaphthalin F, whereupon hydrobromic acid is evolved, and after a few minutes the liquid solidifies in needles. These are washed with ether, and dissolved in a small quantity of warm ether.

Properties. Small, brilliant, doubly oblique prisms. Facial angles = 101° 30′ to 102° 50′ and 101° 15′. Melts at about 170°. Crystallises in needles on cooling, and exhibits dimorphism, like the terchloronaphthalins; for, if a portion be again melted, part of the fused mass crystallises again in needles; but at the same time, a second crystallisation may be observed, of opaque four-sided bodies, which cover the needles. If the whole be melted, no more needles are obtained.

20 C	4	****		 Laurent. 34:43 1:26	
C ²⁰ Be ² Cl ² H ⁴	355		100.00		

It is not decomposed by distillation, or by potash. Scarcely soluble in ether and in alcohol, even on boiling.

2. Modification \$6. Obtained by heating bibromonaphthalin with chlorine.

Properties. It is deposited by the spontaneous evaporation of its ethereal solution, in small doubly-oblique prisms, which are much longer than they are broad. Inclination of the faces = 102° 10′ - 103° - 101° 20′. Melts at 160°, and distils unchanged; solidifies on cooling in a fibrous mass.

Laurent found 33.90 p. c. C. and 1.11 p. c. H. It is not attacked by potash.

Scarcely soluble in ether and in boiling alcohol.

Bihydrobromate of Bibromobichloronaphthalin.

C20H6Br4Cl2 = C20Br2Cl2H4,2 HBr.

LAURENT. Ann. Chim. Phys. 59, 196; further, Rev. scient. 6, 79; 13, 87.

Bromure de chlonaphtèse (Laurent). Dekahexylsuperbromid (Berzelius). Chlordi-bromnaphtylbromur-Bibromwasserstoff (Kolbe). Bibromure de naphtaline bichlorée

Formation and Preparation. Bromine is poured upon bichloronaphthalin in a stoppered bottle, and the stopper is firmly tied down. The bichloronaphthalin first dissolves in the bromine, and then the whole gradually becomes one solid crystalline mass. On opening the bottle, no hydrobromic acid is evolved. The excess of bromine and any unattacked bichloronaphthalin that may be present are removed by washing the product with ether; the residue is dissolved in alcohol or in boiling ether, or heated in a sealed glass tube with ether to 100° (but not higher), and crystallised by cooling the solution.

Properties. Small, brilliant crystals, very like bihydrochlorate of bichloronaphthalin; Fig. 83; u': $u=101^{\circ}30'$; $i:u=94^{\circ}30'$; sometimes the a-faces are completely removed by the enlargement of the faces i; a; u = 133°; a; i = between 121° and 122°. It is colourless.

6 H	71	****	1.05 13.83 61.13		1.05
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Decompositions. 1. Melts a little above 100°, immediately turning red and evolving bromine-vapour. If heat be applied as long as bromine continues to be evolved, bichloronaphthalin C remains in the residue, which may be reconverted into the bromide by means of bromine. — 2. It is decomposed with difficulty by boiling alcoholic potash; a substance is then precipitated by water from the solution, which, when crystallised from ether-alcohol, yields needles, while an oil remains in solution. The needles melt at 55°, volatilise without decomposition, are very readily soluble in alcohol and in ether, and contain 41.8 p. c. C. and 1.7 H.; hence Laurent considers them as C²⁰H^{4.5}Brl¹₆Cl², or as a mixture of 5 At. C²⁰BrCl²H⁵ and 1 At. C²⁰Br²Cl²H⁴. Hence potash acts in the same way as heat, i. e., it removes the bromine as such, and not as hydrobromic acid, and forms a radical or a mixture of two radicals, which cannot be decomposed by distillation.—3. If the bromide be heated with ether in a sealed glass tube between 120° and 130°, it loses the property of crystallising on cooling, and on evaporation needles are obtained, which appear to be bichloronaphthalin C.

Sparingly soluble in cold alcohol, and in cold ether.

Bihydrochlorate of Bibromobichloronaphthalin. C²⁰H⁰Br²Cl⁴ = C²⁰Br²Cl²H⁴, 2HCl.

LAURENT. Rev. scient. 13, 582.

Chlorure de bronaphtèse. (Laurent.) Bichlorobromnaphtyl-Bichlorwassessief. (Kolbe.) Bichlorure de naphtaline bibromée. (Gerhardt.)

Preparation. By passing chlorine over fused bibromonaphthalin a very thick oil is hereby formed, which when diluted with a small quantity of ether, deposits the chloride as a crystalline powder. In this reaction, another oil is formed which, when treated with excess of chlorine, yields the chloride, together with bihydrochlorate of bibromoterchloronaphthalin and a new oil.

Properties. Long, colourless, oblique prisms; Fig. 79, without the i-faces; $u: u = \text{between } 90^{\circ} \text{ and } 91^{\circ}$; $x: x = \text{between } 122^{\circ} \text{ and } 123^{\circ}$; $u: x = 129^{\circ}$. Melts about 155° , and solidifies in prisms on cooling.

					Laurent.	
20 C			28.03	*******	28.14	
6 H		### FF.17		*******	1.51	
C20Br2Cl2H4,2HC1	428	-	100-00			

It is decomposed by distillation, yielding bromine, a hydracid, bromoterchloronaphthalin β , and quadrichloronaphthalin A. — Alcoholic potash converts it into a product crystallising in needles, and rather soluble in ether.

Very slightly soluble in alcohol and in ether.

Appendix to the Bromochlorine-nucleus CoBroCloH4.

Laurent's Bromure de Chlorébronaphtine. C²⁰H^{5.5}Br^{4.5}Cl²?

LAURENT. Rev. scient. 13, 89.

Formation and Preparation. Bichloronaphthalin C is treated with excess of bromine, and exposed for several days to the sun, whereupon

crystals are deposited, which are washed with ether, then dissolved in ether in a sealed tube at 100°, and allowed to cool. Those crystals are selected which have the following shape: Fig. 65; $i:i=108^\circ$; i:u behind $t=102^\circ$; $i:u'=120^\circ$; $u:u=102^\circ$ 30'; i right: $u=125^\circ$. Hence they do not belong to the right prismatic system, but to the oblique or doubly oblique prismatic system.

	20 C 5·5 II 4·5 Br,2Cl	5.5	****	21·56 1·00 77·44	2	
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The analysis should be repeated, since the experimental composition, as well as the properties of the body, resemble those of bihydrobromate of bibromobichloronaph-

It evolves bromine by heat, together with a small quantity of white vapour, and leaves an easily fusible substance.

It is scarcely soluble in ether.

2. Laurent's Bromide a. This compound crystallises from the ethereal solution together with the above-mentioned substance. Right rhombic prisms; Fig. 63; $u': u = 106^{\circ} 30'$; $p: y = 135^{\circ}$. Evolves bromine on application of heat, and leaves an oily residue which solidifies very

It is almost insoluble in boiling ether.

3. Laurent's Bromide & is found mixed with the crystals of the bromide a. Fig. 75; without faces m. Right rhombic prisms: u': u = 100° ; $y: y = 126^{\circ}$; $u': u = 61^{\circ}$.

Evolves bromine and white vapours when heated. Insoluble in ether. 4. Laurent's radical & is likewise mixed with the preceding. Oblique, rhombic prisms. Fig. 121; $y: u = 109^\circ$; $y: v = 107^\circ$ 30'; $u: v = 108^\circ$. Volatilizes without decomposition, and must therefore be a radical; perhaps $C^{20}H^5BrCl^2$ or $C^{20}H^4Br^2Cl^2$; probably the ether had taken up bromine at 100°.

Almost insoluble in ether.

5. Laurent's Chlorenbronaphtone B. C20H4.5Br2Cl1.5

LAURENT. Rev. scient. 12, 215.

Pormation and Preparation. When bromine is mixed with crude hydrochlorate of chloronaphthalin, a hydracid is evolved, and after 24 hours, the bottom of the vessel is found covered with small crystals, which may be easily purified by washing with ether after the oil has been poured off.

Brilliant, colourless, transparent and very small oblique prisms, with oblique base. Angles of faces = between 100° and 103°, inclination of base to one of the sides = about 100°. Volatilises without

Laurent found 36.00 p. c. C. and 1.36 H.; by calculation, 35.9 p. c. C and 1 3 H.

According to Laurent, this compound may have been formed from hydrochlorate of chloronaphthalin; but since it is produced only in very small quantity, he considers it probable that the chloride may have contained a small quantity of chlonaphthene, C²⁰Cl^{1.5}H^{6.5}, and that it may have been derived from this body.

Almost insoluble in alcohol and in ether.

6. Bromenchlonaphtose A. (Laurent.) C²⁰H⁴Br^{1.5}Cl^{2.5}.

LAURENT. Rev. scient. 12, 228.

Formation and Preparation. Fused bibromonaphthalin treated with chlorine, yields amongst other substances, an oily product. If this be separated from the solid product by standing under a small quantity of ether for several days and the ether then driven off; the oil again treated with chlorine with the aid of heat; the liquid portion separated from the solid by ether; and after the ether has been driven off, treated with chlorine in sunshine: a very thick oil is obtained (probably C²⁰Br^{1.5}Cl^{2.5}H⁴,HCl or C²⁰Br^{1.5}Cl^{2.5}H⁴,2HCl). If this be now separated from the solid products by ether, and boiled with alcoholic potash, it deposits a mixture of bromenchlonaphthose A (very soluble in ether), and of bromenchlonaphthose B (almost insoluble in ether), which is separated by means of ether, and purified by recrystallisation from ether.

Properties. It bears a close resemblance to terchloronaphthalin A; crystallises in six-sided prisms or in needles of 120°, the apices of which are rounded off. Soft like wax, and melts when pressed together. Melts at 115° C., and on cooling crystallises in microscopic rosettes. Volatile without decomposition. It is not decomposed by hydrate of potash.

					Laurent.
					mean.
20 C	120	****	36.4	*******	36-17
4 H	4	****	1:2	********	1.65
1.5 Br	120	****	35.6		33.55
2.5 Cl	88.75	****	26.8		27-99
C20Br1-5Cl2-5H4	332-75	-	100.0		99-36

Very soluble in ether, slightly soluble in alcohol.

Bromochlorine-nucleus CaoBrCloH4.

Bromoterchloronaphthalin. C BrCl H*.

LAURENT. Compt. rend. 14, 380; further, Rev. scient. 12, 225.

Formation. Exists according to Laurent in three different modifications, formed under different circumstances.

1. Modification a. (Chloribronaphtose a, Laurent.) Bromine is poured over terchloronaphthalin a, whereupon this compound dissolves without

decomposing. When the solution is exposed to the sun for several days, it evolves hydrobromic acid, and yields bromoterchloronaphthalin, which is purified by repeated recrystallisation from ether-alcohol.

Properties. Colourless, six-sided prisms, with angles = 117° 30′ and two = 125°. It is soft, like wax, and may be bent in every direction without breaking. After it has been melted, it crystallises between 105° and 106° in microscopic rosettes. Volatile without decomposition.

				Laurent.	
20 C 4 H Br,3Cl	4	****	38:99 1:29 59:72	 38·91 1·29	
C20BrC13H4	310.5	****	100.00		

2. Modification B. (Bromachlonaphtose a, Laurent.) A stream of bromine is passed over bichloronaphthalin, which at first is heated till it melts. A thick oily mixture of bihydrochlorate of bibromobichloronaphthalin and an oil is obtained. If this be mixed with ether and allowed to stand, it yields crystals of the solid chloride, while the oil remains in solution. On boiling the crystals with alcoholic potash, bromoterchloronaphthalin is formed, and may be purified by repeated crystallisation from ether-alcohol.

Properties. It exactly resembles quadrichloronaphthalin A, except that the crystals are far more beautiful and well-defined. Six-sided prisms, whereof four angles = 120° 30', and two angles = 119°. Soft, like wax; after fusion, it solidifies at about 110° in microscopic rosettes. Volatile without decomposition. It is not attacked by potash.

Laurent found 38.91 p. c. C. and 1.30 p. c. H.

It is rather soluble in ether, but less than the modification a; scarcely soluble in alcohol.

3. Modification y. (Bromachlonaphtose b, Laurent.) When bihydrobromate of bibromobichloronaphthalin is distilled, bromine and acid vapours are evolved, and a mixture of terchloronaphthalin A and bromoterchloronaphthalin γ condenses in the receiver. Ether extracts ter-chloronaphthalin from the mixture, and leaves a white powder which is boiled with more ether. This solution, when left to evaporate, deposits small, brilliant, perfectly defined prisms.

Properties. Oblique prisms, with oblique base. Inclination of the sides = 102° 30′; inclination of the faces to the base = 101° and 103°. Volatile without decomposition.

Laurent found 39.04 p. c. C. and 1.48 p. c. H.
Dissolves very slightly in alcohol and in boiling ether.

Bromanchlonaphtone A. (Laurent.)

C20H4.5Br0.5Cl3 ?

LAURENT. Rev. scient. 12, 216.

Chlorine is passed into bromonaph-Formation and Preparation. thalin, and after a short time the oil thus obtained is freed from solid matter by mixing with a little ether, and after the ether has been driven off, the oil is gently warmed and again treated with chlorine till it deposits crystalline matter afresh. This is removed by ether, and the oil is boiled with alcoholic potash. (The oil is probably C²⁰Br^{0.6}Cl³H^{4.6} + HCl or + 2HCl). The product is purified by crystallisation from boiling ether containing a little alcohol, and by spontaneous evaporation.

Properties. It bears a close resemblance to terchloronaphthalin A, but forms much finer crystals: they are six-sided prisms of 120°, the cleavage being parallel to the axis. Soft, like wax, and may be bent in every direction. Melts at 106°, and solidifies in microscopic rosettes. Distils without decomposition.

				3	Laurent.
20 C			44.45		44.03
4.5 H				*******	1.62
0.5 Br,3Cl	146'5	3116	53.89		
C20Br0-5Cl3H4-5	271.0		100.00		

(0.500 bromanchlonaphtone being decomposed by lime, required 0.710 silver for the precipitation; by calculation 0.700 silver. The precipitate treated with chlorine evolved bromine.)

Dissolves somewhat readily in ether, and very slightly in alcohol.

Bromochlorine-nucleus C20Br2Cl3H3.

Bibromoterchloronaphthalin. C[®]Br²Cl³H³.

LAURENT. Rev. scient. 12, 231.

Bromide of terchlorobromonaphthyl. (Kolbe.)

Exists, according to Laurent, in two isomeric modifications.

1. Modification a. (Broméchlonaphtuse b; Laurent.) When bihydrochlorate of bibromoterchloronaphthalin is boiled with alcoholic potash, a white powder is formed, which is dissolved in a large quantity of boiling ether, or better still in boiling rock-oil, and allowed to crystallise. The ethereal mother-liquor contains in solution a small quantity of a substance crystallising in needles.

Properties. Crystallises from ether by spontaneous evaporation in small and very brilliant prisms of the doubly oblique prismatic system. Fig. 124, without z-faces, with e-faces; $v: u = 101^{\circ} 30'$; $y: w = 101^{\circ} 20'$; $y: v = 101^{\circ}$; $e: u = 132^{\circ}$; $e: y = 115^{\circ}$; $e: v = 115^{\circ} 30'$. After it has been melted, it crystallises at 165° in long prisms. Volatilises without decomposition.

decomposition.

It is not attacked by potash.

					Laurent.	
20 C 3 H 2 Br,3Cl	3		31·13 0·80 68·07	*******	31·27 0·90	
CmBrtClaHa	389.5	-	100.00			ш

2. Modification β. (Chloribronaphtuse.) Bromine is poured over bihydrochlorate of bichloronaphthalin, and the mixture is exposed for four weeks to the sun. On treating the mass with ether, an oil and a crystallisable substance are dissolved out, and a residue of bibromoter-chloronaphthalin, which is almost insoluble in ether, remains:

$$C^{20}H^8Cl^4 + 6Br = C^{20}Br^2Cl^3H^3 + 4HBr + HCl.$$

White powder, which crystallises from fusion in rectangular parallelograms, crossed by two diagonals.

							Laurent.	
20	C	******************	120		30.80	*******	30.90	
3	H		3		0.78	*******	1.10	
3	CI		106.5		27.35			
2	Br		160.0	****	41.07			
Ca	Br	Cl3H8	389.5		100.00			

Bihydrochlorate of Bibromoterchloronaphthalin.

 $C^{20}H^{5}Br^{2}Cl^{5} = C^{20}Br^{2}Cl^{3}H^{3}, 2HCl.$

LAURENT. Rev. scient. 13, 583; further, Compt. chim. 1850, 1; abstr. Ann. Pharm. 76, 301.

Perchlorure de bronaphtèse (the compound was first described by Laurent under this name, and the formula written C²⁰H⁶Br²Cl⁵). Chlorure de bronichlonaphtèse (Laurent). Terchlorobromnaphthylchlorür Bichlorwassertoff (Kolbe.)

Formation and Preparation. By the action of chlorine on bihydrochlorate of bibromobichloronaphthalin.

Properties. Prisms of the doubly oblique prismatic system, very similar to those of the oblique prismatic system. Fig. 124 without faces, z, with faces q, b, k, d; u: $v = 110^\circ$; y: $k = 119^\circ$; w: $y = 101^\circ$; k: l = about 77°; q: $d = 93^\circ$; d: $t = 106^\circ$. It has also been obtained in rhombic prisms by Laurent. Melts at about 150°, and crystallises in rhombic tablets on cooling. If it be heated a little above its melting point, it remains soft and transparent on cooling, and solidifies but partially, in a non-crystalline mass, which, if gently heated, crystallises in rhombic tablets.

Decompositions. On distillation it evolves bromine and a hydracid, and yields three other substances. (Comp. Bromachlonaphtune B, p. 78.) — It is converted by boiling alcoholic potash into bibromoterchloronaphthalin a. (Laurent previously obtained in this reaction another radical, chlorénbronaphtune CDBr1-5Cl3H3.5; see Rev. scient. 12, 229.)

Dissolves very sparingly in ether.

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Appendix to the Bromochlorine-nucleus, C20 Br2Cl5H3.

Laurent's Bromochlonaphtune B. C20BrCl3.5H3.5.

LAURENT. Rev. scient. 12, 230.

Formation and Preparation. When bihydrochlorate of bibromoterchloronaphthalin is distilled, bromine and a hydracid are evolved, and the following products are obtained: 1. Bromachlonaphtune B; 2. A chloride or a chloro-bromide of the series A, crystallising in sixsided prisms of 120°, and melting in boiling water; 3. A very small quantity of a substance crystallising from ether in small opaque nodules; less soluble in ether than 2, but more soluble than 1. - 2 and 3 are extracted from the mixture by ether; the bromachlonaphtune is dissolved in a very large quantity of boiling ether, and crystallised by spontaneous evaporation of the solution.

Very minute oblique prisms, with oblique base; Fig. 81, $u:u'=101^\circ$; i:m= between 100° and 103° ; i:u= between 100° and 103° . When fused, it sometimes solidifies suddenly in an opaque mass, some-

times in fine needles.

Laurent found 36.83 p. c. C. and 1.11 p. c. H.; by calculation, 36.83 p. c. C. and 1.07 p. c. H.

Nitro-nucleus C20XH7.

Nitronaphthalin. $C^{20}NH^7O^4 = C^{20}XH^7$.

LAURENT. (1835.) Ann. Chim. Phys. 59, 376; Ann. Pharm. 19, 38; J. pr. Chem. 8, 13; Ann. Chim. Phys. 66, 152; Rev. scient. 6, 88; further, 13, 68.

MARIGNAC. Ann. Pharm. 38, 1,

ZININ. J. pr. Chem. 27, 140; Ann. Pharm. 44, 283. PIRIA. Compt. rend. 31, 488; N. Ann. Chim. Phys. 31, 217; Ann. Pharm. 78, 32; J. pr. Chem. 52, 56; Pharm. Centr. 1850, 780; Liebig & Kopp's Jahresber. 1850, 500.

N. Ann. Chim. Phys. 42, 186; Ann. Pharm. 92, 401.

Nitronaphtalase, Ninaphtase, C²⁰XH⁷ (Laurent); Nitrite de naphtalese, C²⁰H⁷O,NO² (Laurent, Ann. Chim. Phys. 66, 152), Nitrite of Icodecatesserpt, C²⁰H⁷O,NO³ (Berzelius); Naphthylnitrür (Kolbe).

Formation. 1. Nitronaphthalin was first prepared by Laurent by boiling naphthalin with nitric acid, whereby red vapours are evolved and nitronaphthalin and an oil are formed :

C20H3 + NO6, HO = C20XH7 + 2 HO.

2. From naphthalin and nitric acid in the cold, without formation of red vapours and an oil (Piria). - 3. By the action of hyponitric acid on naphthalin in the cold, whereby a peculiar oil is simultaneously formed; this oil, after being exposed for some time to the air, aquires the smell of bitter almonds. (Laurent.) According to Laurent, an oil is produced by the action of aqua regia on naphthalin in the cold, which on distillation yields carbon and another oil from which a little nitronaphthalin is deposited on cooling.

Preparation. From 5 to 6 pts. nitric acid of sp. gr. 1.33 are added to 1 pt. of naphthalin, and the whole is allowed to digest for 5 or 6 days. The matter easily cakes and must therefore at first be frequently stirred. Lemon-yellow nitronaphthalin, without any by-products, is obtained, and is washed on a filter with water. (Piria.)—2. Naphthalin is boiled with nitric acid, whereupon red vapours are evolved, till, after 15 or 20 minutes, a yellow oil has been formed, which on cooling solidifies very slowly in a crystalline mass, consisting of nitronaphthalin and a reddish-yellow oil. This is submitted to strong pressure between blotting paper and dissolved in hot alcohol. On cooling, the liquid first deposits an oil which must be removed with a pipette; afterwards nitronaphthalin crystallises out, and is collected after 12 hours and recrystallised once or twice. The oil which has been removed with the pipette, yields a fresh crop of crystals when redissolved in the alcoholic mother-liquid. (Laurent.)

Properties. Brittle, sulphur-yellow, six-sided rhombic prisms, derived from prisms with angles of 100° and 80°, the acute angles being truncated. Melts at 43°, the thermometer rising to 54° at the moment of solidification. A few crystals melted on a glass plate, form oily drops which remain fluid for some time at ordinary temperatures, but on slight agitation, instantly solidify in needles. Volatilises without decomposition and sublimes in small needles; when rapidly heated, a considerable quantity decomposes with emission of reddish light, and forms a large deposit of carbon. (Laurent.)

						mea	
					earlier.		later.
20 C	120		69.35		69.86		68.70
7 H	7		4.06	********	4.07		4.07
N	14	****	8.10	********	8.53	****	8.30
40	32	****	18.49	********	17.54		18.93
C20XH7	173		100.00		100.00	****	100.00

Decompositions. 1. Chlorine at a gentle heat converts it into an oil (C²⁰Cl³H⁵,HCl?), which yields with potash terchloronaphthalin A. If the nitronaphthalin be too strongly heated, terchloronaphthalin A or quadrichloronaphthalin A may be directly formed. (Laurent.)—2. With bromine, aided by a gentle heat, it forms hydrobromic acid and bibromonaphthalin; the experiment should be repeated. (Laurent.)—3. It is not attacked by iodine.—4. It dissolves unchanged in fused sulphur; if a stronger heat be applied, the mass begins to boil, evolves sulphurous acid, and the heterogeneous green mass thus formed dissolves partially in ether with green colour; the portion insoluble in ether swells up by heat and leaves a very bulky residue of charcoal. (Laurent.)—6. Nitronaphthalin boiled with permanganate of potash, yields nitrate and phthalate of potash. (Cloez and Guignet, Compt. rend. 47, 712; J. pr. Chem. 76, 500.)—7. Hydrochloric acid is without action upon it.—8. Oil of vitriol dissolves nitronaphthalin, and water reprecipitates it unchanged; on boiling, the solution becomes brown and is no longer precipitated by

water; on neutralising the liquid with lime, filtering and evaporating, a saline mass, soluble in alcohol, is obtained. (Laurent.)—9. It is converted by fuming sulphuric acid into nitrosulphonaphthalic acid, C²⁰XH⁷,2SO³. (Laurent, Rev. scient. 13, 590.)—10. Potassium decomposes it suddenly at 43°, with evolution of light and deposition of carbon. (Laurent.)—11. It is but slightly attacked by boiling aqueous potash; the liquid becomes brown, and on the addition of an acid deposits a few brown flakes. With alcoholic potash it forms a red liquid; on testing it from time to time with oil of vitriol, a dark green, blueish or violet-blue coloration is obtained; on continued boiling, the mass swells up, decomposes, and leaves a very bulky residue of charcoal. (Laurent.)—If nitronaphthalin be heated in a water-bath for 6 hours with a paste of 2 pts. hydrate of potash in as little water as possible, and 1 pt. fresh hydrate of lime, the water being replaced as it evaporates, it is completely decomposed, and yields the potash-salt of nitrophthalic acid, C²³H¹⁴N²O¹⁰, which dissolves in water with dark yellow colour, and nitrophthalin, C¹⁰H⁷NO⁴, to which a brown substance obstinately adheres. (Dusart, N. Ann. Chim. Phys. 45, 332.)—12. Heated with an excess of hydrate of baryta or lime, it evolves ammonia, naphthalin, an oil, and naphtalase, C²⁰H⁷O (p. 25). (Laurent.)

C²⁰H⁷O (p. 25). (Laurent.)

13. When nitronaphthalin is dissolved in alcohol and the warm solution is treated with sulphuretted hydrogen, naphthylamine, C²⁰NH³, is formed, and the liquid turns greenish-yellow and deposits sulphur. This decomposition is more rapidly effected by sulphide of ammonium. (Zinin.)

—14. When 1 pt. of nitronaphthalin is heated to 100° with a moderately concentrated solution of ferrous acetate (2 pts. iron) for a quarter of an hour, it yields naphthylamine and ferric oxide; the same reaction takes place with lively effervescence, when 1 pt. nitronaphthalin is heated with 1½ pts. iron filings and sufficient acetic acid to cover the mixture (Béchamp); at the same time another base, phthalamine (C¹⁶H⁹NO⁴) is formed. (Schützenberger & Willm., Compt. rend. 47, 82; J. pr. Chem. 75, 117.)—15. When nitronaphthalin in alcoholic solution is boiled for 8 hours with aqueous sulphite of ammonia, it is converted into the two isomeric compounds thionaphthamic acid and naphthionic acid, C²⁰H⁹NS²O⁶. (Piria.)—16. An alcoholic solution of nitronaphthalin, heated with bisulphide of carbon in a sealed tube to 160°, yields naphthylamine and sulphur. (Schlagdenhaufen, N. J. Pharm. 34, 175.)

Combinations. Insoluble in water; very soluble in alcohol, ether, and in chloride of sulphur. (Laurent.)

Conjugated Compounds of the Nitro-nucleus CooXH.

Nitrosulphonaphthalic Acid. C²⁰H⁷NS²O¹⁰ = C²⁰XH⁷,2SO³.

LAURENT. Rev. scient. 13, 68, 587 and 588; Compt. rend. 21, 33; Compt. chim. 1849, 390; abstr. Ann. Pharm. 72, 297; Liebig & Kopp's Jahresber. 1849, 440; Compt. rend. 31, 537; J. pr. Chem. 52, 58; Pharm. Centr. 1851, 157; Liebig & Kopp's Jahresb. 1850, 508.

Acide sulfaninaphtèsique and nitrasulnaphtèsique; Acide sulfanaphtalique nitri (Laurent); Nitranaphthylodithionic acid (Kolbe). Nitranaphtalinschwefelsäure.

Formation. 1. By boiling sulphonaphthalic acid with nitric acid

(acide sulfaninaphtésique); or 2. By dissolving nitronaphthalin in fuming sulphuric acid (acide nitrasulnaphtésique). (Laurent.)

Preparation. Nitronaphthalin is heated with fuming sulphuric acid, wherein it dissolves with a red colour, gradually turning to brown; the solution is then mixed with water, filtered from undecomposed nitronaphthalin, neutralised with chalk, filtered, and evaporated; whereupon the lime-salt crystallises out and is purified by dissolving in alcohol, filtering, and evaporating the solution.—2. Sulphonaphthalate of lime is boiled with nitric acid; the acid solution is evaporated to dryness; the residue washed with a little alcohol, then dissolved in weak alcohol, and the solution is decomposed by sulphuric acid; the filtered solution is saturated with baryta, and the excess of baryta precipitated by carbonic acid, and the liquid is filtered and evaporated; it then deposits crusts of the baryta-salt. — The free acid is separated from the baryta-salt by means of sulphuric acid, care being taken to avoid an excess of acid, or from the lead-salt by sulphuretted hydrogen, and the filtrate is finally evaporated in vacuo.

Properties. Microscopic, rhombic laminæ.

With sulphide of ammonium it yields acide sulfonaphtalidamique (naphthionic acid ?).

Very soluble in water.

The nitrosulphonaphthalates take fire when heated in closed vessels. Ammonia-salt. The solution left to evaporate sometimes yields rhombic laminæ, sometimes long needles.

Potash-salt. May be obtained in irregular crystals by the spontaneous evaporation of its solution; slightly soluble in alcohol.

Nitrosulphonaphthalate of Baryta. Crusts.

					Laurent.	
20 C	120	****	37.5	,,,,,,,,	36.43	
6 H	6	****	1.8	****	1.75	
N	14	****	4.4			
SO ²	32	****	10.0	*******	9.60	
BaO, SO3	116.5	****	36.3	********	36:36	
40	32		10.0			
C ³⁰ XBaH ⁶ ,2SO ³	320.5		100.0			

Nitrosulphonaphthalate of Lime. The salt dried in vacuo, loses at 140° 3.00 p. c. water; 1 At. = 3.20 p. c.

					Laurent.
20 C	120		42.60		42'00
7 H			2'48	*******	2.50
NO4	46	****	16.35		
2 SO3	80	****	28.46	********	28.75
CaO	28		10.11	********	10.22

Nitrosulphonaphthalic acid is very soluble in alcohol and in ether.

Nitro-nucleus C20X2H8.

Binitronaphthalin. C²⁰H⁶N²O⁶ = C²⁰X²H⁶.

I.AURENT. Ann. Chim. Phys. 59, 376; Ann. Pharm. 19, 38; J. pr. Chem. 8, 13; Rev. scient. 6, 88; 13, 68.
 MARIONAC. Ann. Pharm. 38, 1.

Binitrite de naphtalèse, C²⁰H⁶O², 2NO³; Nitronaphthalèse, Ninaphtèse C (Laurent). Nitronaphtylnitrür. (Kolbe.)

Formation. Naphthalin or nitronaphthalin is boiled for a long time with nitric acid. (Laurent, Marignac)

Preparation. Nitric acid is boiled in a large bolt-head and naphthalin gradually added as long as it continues to dissolve; on cooling, the liquid deposits pale yellow needles, which are washed, first with nitric acid, then with water, and finally with alcohol. (Laurent.)—2. If nitronaphthalin be rapidly boiled down with nitric acid in a glass bolt-head, the oily stratum at first formed dissolves in the nitric acid, as soon as both occupy about equal volumes. The bolt-head is now taken off the fire, and on cooling, the whole solidifies in a mass which is first washed with hot water, then with hot alcohol. (Laurent.)—3. Naphthalin is boiled with nitric acid for several days in a retort, the acid distillate being poured back in small portions by means of a funnel drawn out to a fine point. After each addition of acid, it is necessary to wait till no more red vapours are evolved, and the mass in the retort must be washed ont every evening. In this manner, the following products are obtained:

1. An aqueous solution of nitronaphthalic acid; 2. An insoluble residue, principally of ternitronaphthalin (p. 88), and a small quantity of a yellowish, viscid resin, insoluble in water; 3. Binitronaphthalin, partly sublimed in the neck of the retort, and partly dissolved in nitric acid in the distillate. The greater part of the nitric acid is evaporated off at a gentle heat, and water is then added to the residue, whereby the binitronaphthalin is completely precipitated. (Marignac.)

Properties. Light powder consisting of microscopic needles; crystallises from its nitric acid solution in rhombic prisms of 67° and 113°, (Laurent); and from its solution in a very large quantity of boiling alcohol, in fine, flexible, slightly yellow needles, (Marignac). Melts at 185°, and when heated strongly in small quantities, sublimes without decomposition, in small needles. When large quantities are rapidly heated, or when it is heated in close vessels, it suddenly decomposes, evolves gas with violence, and yields much carbon with emission of red light (Laurent.) Neutral to test-papers.

C Springs				Laurent.	Marignac.
20 C	120 .	55.05	********	54.83	. 54-92
	6				
2 N	28 .	12.84	********	12-70	1246
80	64	29.36	********	29:57	29-79
C20X2H4""	218	100.00	Printers.	100.00	100.00

Decompositions. 1. Treated with chlorine aided by a gentle heat, it evolves nitrous fumes; and if the action of the chlorine is discontinued t the preper time, bichloronaphthalin Y is obtained together with an oil, which by distillation or treatment with hydrate of potash, yields hydrochloric acid and terchloronaphthalin A, and hence must be a souschlorure de chlonaphtèse, (Laurent.) — 2. By prolonged boiling with nitric acid it is converted into ternitronaphthalin, (Laurent, Rev. scient. 13, 70.) — 3. Fused with sulphur, it evolves sulphurous acid and sulphuretted hydrogen, leaving a residue of very porous charcoal. (Laurent.) — 4. Binitronaphthalin is but slightly attacked by concentrated aqueous potash; with alcoholic potash, it forms a red liquid in the cold, and on boiling, rapidly turns brown and evolves ammonia, the reaction being completed in a quarter of an hour. A body resembling ulmic acid, viz., nitronaphtalesic acid, is precipitated from the solution by nitric acid. (Laurent.) In order to purify this body, it is washed on a filter with boiling water, dried, and treated with ether, which extracts a small quantity of a brown substance. — The acid is brownish black, and tasteless. Laurent found in it 62.2 p. c. C, 2.3 p. c. H. and 13.1 p. c. N. Heated on platinum-foil, it decomposes without melting, and leaves a bulky residue of carbon. It is rather easily attacked by boiling nitric acid, being converted into a light brown substance, completely soluble in a large quantity of nitric acid. Water precipitates from the solution yellow flakes, which deflagrate by heat, and form salts with ammonia and potash, which decompose with deflagration when heated in closed vessels. The nitric acid mother-liquid from the flakes, yields another crystalline acid by evaporation. Nitronaphthalesic acid is insoluble in water, in alcohol and in ether, and forms salts which glow when heated in close vessels. Its alkaline salts are brown, crystallisable, and soluble. (Laurent.)

5. Binitronaphthalin, heated with hydrate of lime, evolves naphthalin,

ammonia, and a brown oil. (Laurent.)

6. With sulphuretted hydrogen it forms a carmine-coloured base, which melts on warming, and, deflagrates when heated in close vessels; probably nitronaphthylamine (?). (Laurent, Compt. rend. 31, 537; J. pr. Chem. 52, 58.) — 7. Treated with sulphide of ammonium, like nitronaphthalin for the preparation of naphthylamine, it yields fine red needles of seminaphthylamine, C²⁰N²H¹⁰. (Zinin, J. pr. Chem. 27, 152, and 33, 29.) — Its feebly ammoniacal, boiling solution is reduced by sulphuretted hydrogen in about three hours to ninaphthylamine, C²⁰H⁸N²O² (isomeric with nitrosonaphthylin), (Ch. S. Wood, Chem. Gaz. 1859, 218; Chem. Centr. 1859, 1836.)

$C^{20}X^{2}H^{6} + 8HS = 6HO + 8S + C^{20}H^{8}N^{2}O^{2}$

8. Its alcoholic solution is converted by zinc and hydrochloric acid into nitrosonaphthylin, C²⁰H⁸N²O². (Church & Perkin, Chem. Soc. Qu. J. 9, 1; J. pr. Chem. 68, 248.)

Conjugated compounds of the Nitro-nucleus C20X2H6.

Binitrosulphonaphthalic Acid. C²⁰H⁶N²S²O¹⁴ = C²⁰X²H⁶, ²SO³.

LAURENT. Compt. rend. 31, 537; J. pr. Chem. 52, 58; Pharm. Centr. 1851, 157; Liebig & Kopp's Jahresb. 1850, 508.

Binitronaphtalinschwefelsäure. Known only in combination with ammonia.

Formation and Preparation. By long continued treatment of sulphonaphthalic acid with nitric acid.

Binitrosulphonaphthalate of ammonia. Crystallises in beautiful yellow needles, and treated with sulphuretted hydrogen, it deposits sulphur, and yields a new nitro-acid, apparently acide sulfonaphtalidamique nitré, (nitronaphthionic acid?).

Nitro-nucleus C20X3H5.

Ternitronaphthalin.

 $C^{20}H^5N^3O^{12} = C^{20}X^3H^5$.

LAURENT. Rev. scient. 6, 84 and 86; 13, 71. MARIGNAC. Ann. Pharm. 38, 1.

Nitronaphtalise, Ninaphtise. (Laurent.)

Formation. By prolonged boiling of naphthalin with nitric acid, in three isomeric modifications, a, β , and γ , which differ only in crystalline form, melting-point, and solubility.

Modification a. (Ninaphtise G Laurent.) When naphthalin is boiled for a day or two with nitric acid, almost colourless crystals are obtained, which are a mixture of binitronaphthalin, naphthaleïse and ternitronaphthalin a and β, the last being formed in the largest quantity. Binitronaphthalin and naphthaleïse are extracted by ether, and the residue is heated with such a quantity of alcohol, that on cooling about half remains dissolved. This solution yields by spontaneous evaporation, long rhombic laminæ of ternitronaphthalin a, mixed with needles, which are separated by shaking up the whole and pouring off the suspended crystals. By repeatedly recrystallising the laminæ from boiling alcohol and picking out the needles, ternitronaphthalin a is obtained in a state of purity. (Laurent.)

Properties. Pale yellow, inodorous. Crystallises from boiling alcohol

Properties. Pale yellow, inodorous. Crystallises from boiling alcohol on cooling in long rhombic tablets, which are generally very irregular and indented like a saw. If it be heated to 100° with ether in a scaled tube, six-sided prisms are obtained, derived from a rhombus of 50° and 130°. Melts at 210°, and solidifies in a fibrous mass on cooling. Heated on a glass plate in the air, it volatilises undecomposed; but if it be heated in a tube, it takes fire, gives off a brown smoke, and leaves a residue of

charcoal.

					1	Laurent.
20 C		120	in	45.6	*******	45.5
5 H	***************************************	5	****	1.9	*******	2.0
3 N		42	****	16.0	*******	16.3
12 0	***************************************	96		36.5		36.2

Decompositions. 1. By chlorine it is first turned red, and then completely decomposed. (Laurent.) — 2. Heated with lime, it undergoes combustion. (Laurent.) — 3. It dissolves in alcoholic potash and forms a red solution, which turns brown on boiling and evolves ammonia. On neutralising the solution with an acid, a voluminous brown precipitate of

nitronaphthalesic acid is obtained. This acid resembles nitronaphthalesic (p. 87) and nitronaphthaleisic acids, and decomposes with deflagration on heating in a close vessel. Its compounds with the alkalis are brown, uncrystallisable. Nitronaphthalesic acid contains more carbon than ternitronaphthalin (1), (Laurent). — 4. It dissolves slowly and with difficulty in a saturated alcoholic solution of ammonia, forming a rosecoloured liquid, which, if saturated with sulphuretted hydrogen, turns yellowish and reddish brown, and then dissolves a considerable quantity more of the excess of ternitronaphthalin. The solution turns green when heated but does not deposit sulphur. If the liquid be distilled almost to dryness, and the residue treated with boiling water, it yields a carmine-red solution, which on cooling deposits a reddish-brown powder,

not possessing basic properties. (Zinin, J. pr. Chem. 33, 34.)

Combinations. 1. Dissolves very sparingly in boiling alcohol.—

2. It dissolves in nitric acid, and oil of vitriol without decomposition, if

they be not too strongly heated. (Laurent.)

Modification β. (Ninaphtise GL, Nitronaphtale, Laurent). All the residues from the previously described modification are mixed together and boiled with nitric acid for five or six days. On cooling, beautiful needles are obtained, which are washed on a funnel (without paper) first with nitric acid, and then with water and with alcohol. If the crystals be immediately washed with water, a resin is precipitated, which mixes with the ternitro-naphthalin. The crystals when dry must be washed with ether, to remove traces of this resin. (Laurent.)

Properties. Colourless when freshly crystallised, becomes slightly yellow and dull after washing with water and drying. It closely resembles terchloronaphthalin a, but has a different crystalline form. Heated in a sealed tube to 100° with ether, it crystallises on cooling in brilliant, yellow, exceedingly small, oblique rhombic prisms: Fig. 93, with faces $t.u:u=50^\circ$; i:t behind = 126; t:u=124; $i:t=110^\circ$; $i:u=98^\circ$ 15'; $f:u=104^\circ$ 30'. Although the crystals of a and β have one angle in common, yet they cannot be confounded with one another. (Laurent.) Melts at 215°; 0.1 gramme melted on a glass plate, remains transparent on solidifying, and then crystallises suddenly when it is again heated below its melting point, or when gently stirred with a pointed instrument. Heated on platinum-foil, it appears to volatilise undecomposed; but when heated in closed vessels, it suddenly decomposes with emission of light.

				Laurent.				
				fir	st analy	8i8.	later.	
20 C	120		45.6	*******	45.45		45.6	
5 H	5	****	1.9		1.92		2.0	
3 N	42	1500	16.0	*******	17.25	****	16.8	
12 0	96		36.5	******	55.38	****	35.6	
C20X3H5	263	-	100-0	,,,,,,,,	100.00		100.0	

Laurent previously considered the compound to be C19H5N3O11; Berzelius (Jahresbericht, 23, 534) considered it to be isomeric with ternitronaphthalin a, which Laurent afterwards found to be the fact.

Decompositions. 1. Dissolves readily in hot oil of vitriol without decomposition; but if the solution be too strongly heated, it turns brown and evolves sulphurous acid. — 2. It takes fire when heated with hydrate of baryta in a closed vessel. — 3. Boiling alcoholic potash first turns it orange-red, then brown, and decomposes it; the brown solution gives with acids a brown precipitate resembling nitronaphthalisic acid. (Laurent.) — 4. Boiling nitric acid decomposes it in a similar manner. (Laurent.)

Of all the nitro-compounds of naphthalin, it is the most insoluble in

alcohol and in ether.

Modification q. Marignac's ternitronaphthalin. The insoluble residue which remains when binitronaphthalin is prepared by boiling naphthalin for a long time with nitric acid (p. 87, 3), is impure ternitronaphthalin q. To purify it, it is again washed with water, finely pulverised, and treated with cold ether; which thereby acquires a yellow colour and yields a viscid resin on evaporation. (Marignac.)

colour and yields a viscid resin on evaporation. (Marignac.)

Properties. Slightly yellow; it is deposited from boiling alcohol as a crystalline powder. Melts a little above 100°. When carefully heated it volatilises without residue, but often decomposes very rapidly, with slight explosion and reddish flame, leaving a large residue of earbon.

				Marignac mean.
20 C	120 -	****	45.6	 46-12
5 H		****	1.9	 1.96
3 N	42		16.0	 16.59
12 0	96	****	36.5	 35.33

Hence it is C20H5O3,3NO3 or C20H5,3NO4 (Marignae).

Decomposition. Dissolves with beautiful red colour in caustic alkalia and their carbonates, slowly in aqueous and rapidly in alcoholic potash. The red alcoholic potash-solution becomes dark or blackish-brown, slowly in the cold, but almost instantly when heated, evolving a large quantity of ammonia; the liquid having absorbed carbonic acid, effervesces when it is saturated with an acid, and yields a flocculent, bulky, brownish-black precipitate = C¹²H³NO⁵. The brown body dries up to a hard, black, shining mass, resembling anthracite.

3 H	14	****	2·30 10·85	*******	2.69
**	14		-		2000

When the liquid separated from the brown body is distilled, it yields formic acid and exhales a feeble odour of prussic acid, which however cannot be detected in the solution. Since prussic acid is decomposed by potash into formic acid and ammonia, the decomposition is perhaps as follows:

The brown body heated in a tube, evolves water and empyrenmatic vapours and leaves a large amount of carbon; it decomposes when rapidly heated on platinum-foil, emitting red sparks. It is not acted upon by concentrated hydrochloric acid, or by diluted nitric and sulphuric acids, but is decomposed by oil of vitriol with evolution of sulphurous acid. It dissolves in concentrated nitric acid, nitrous acid being set free; the yellow solution gives with water a pulverulent precipitate insoluble in water, soluble in ether.

Almost insoluble in water and in alcohol, to which it nevertheless

imparts a yellow colour. Quite insoluble in ether.

The dry brown substance also dissolves readily in caustic alkalis and their carbonates, forming brown solutions, without expelling carbonic acid from the carbonates. The solutions yield viscid masses by slow evaporation. When the ammoniacal solution is boiled, it gradually parts with its ammonia and deposits the brown substance. Salts of silver, lead, baryta, and lime precipitate the brown substance from its solutions in combination with small quantities of the salt employed, or of the corresponding metallic oxide; the precipitates have, however, no definite composition, and appear to decompose by prolonged washing. The brown body is precipitated by acids from its solution in alkalis. (Marignac.)

Combinations. 1. Ternitronaphthalin γ is insoluble in cold water, and only so far soluble in boiling water, that the liquid becomes turbid on cooling.

2. Dissolves slightly in nitric acid, and is precipitated therefrom by

Z. DE

water.

3. Dissolves sparingly in boiling alcohol. — 4. It is almost insoluble in ether; even in boiling ether.

Appendix to Ternitronaphthalin.

Nitronaphthaleïse (Laurent). C²⁰H^{5.5}N^{2.5}O¹⁰ = C²⁰X^{2.5}H^{5.5}.

LAURENT. Rev. scient. 6, 88; 13, 70.

Ninaphtine. (Laurent.)

Formation and Preparation. The nitric acid mother-liquid which remains in the preparation of binitronaphthalin (p. 86, 2) still contains a large quantity of that substance in solution; this solution is boiled for several hours in a retort, whereupon, while the whole is still warm, an oily mixture of binitro- and ternitro-naphthalin (both of which are scarcely soluble in ether), and nitronaphthaleise (rather soluble in ether) is deposited at the bottom of the vessel. The oil solidifies in a yellow waxy mass; which is washed with alcohol and boiled with ether; whereupon the solution by spontaneous evaporation yields crystals of nitronaphthaleise mixed with a little binitronaphthalin. The mother-liquid still contains some nitronaphthaleise and an oil. The crystals are treated with warm but not boiling ether, the solution is evaporated, and the residue completely purified by repeated recrystallisation from alcohol.

Properties. Pale yellow. Crystallises from alcohol or from ether in

small feathery needles. Melts in boiling alcohol (hence it cannot be a mixture of bi- and ter- nitronaphthalin, both of which melt near 200°), and on cooling solidifies in an opaque radiated mass. — Distils partly undecomposed, but decomposes suddenly after a few moments with evolution of light.

					1	Laurent.
20 C		120		49.90	*******	49.3
5.5 H	***************************************	5'5	****	2.27	******	2.3
2.5 N		35	****	14.55	*******	14.8
10 0		80	****	33.28		33.6
C20 X2	5H543	240.5	Total Control	100.00		100.0

It imparts a red colour to alcoholic potash and then decomposes by boiling, evolving ammonia; the brown liquid gives with acids a brown precipitate of nitronaphthaleïsic acid. This compound resembles naphthaleïsic acid, and forms with alkalis brown uncrystallisable salts which decompose with deflagration when heated in closed vessels. Laurent found in the analysis of nitronaphthaleïsic acid, 51.8 p. c. C. 2.6 p.c. H., and 31.8 p.c. N.

Nitronaphthaleïse is insoluble in water. It dissolves unchanged in nitric acid; sparing in hot oil of vitriol, and is precipitated therefrom by

water.

Slightly soluble in alcohol, rather soluble in ether.

Bromonitro-nucleus C20BrX2H5.

Bromobinitronaphthalin. C²⁰H⁶BrN²O⁸ = C²⁰BrX²H⁵.

LAURENT. Compt. rend. 21, 35; Compt. chim. 1850, 1; abstr. Ann. Pharm. 76, 298; Pharm. Centr. 1850, 310; Liebig & Kopp's Jahres. 1850, 497.

Nitrobronaphtise. (Laurent.)

Formation and Preparation. When bibromonaphthalin is boiled with nitric acid, a solution is obtained from which water precipitates an oil solidifying in the cold. The product is purified by repeated crystallisation from ether. (The acid liquid, from which the bromobinitronaphthalin has crystallised, yields by evaporation a mixture of oxalic and bromophthalic acids.)

Properties. Yellow substance.

					Laurent.
20 C	120	****	40.50	********	40.35
5 H	5	1111	1.67	*********	1.55
Br	80	****	26.90	*******	26.40
2 N	28		9.50		10.25
80	64	****	21.43	******	21.45
C20BrX2H8	297		100-00		100.00

Thus 1 At. Br and 1 At. H of bibromonaphthalin are replaced by 2 At. X.

When rapidly heated in a glass tube, it explodes.

Insoluble in water; readily soluble in ether, less soluble in alcohol.

Azo-nucleus C20NH7.

Naphthylamine.

$C^{20}NH^9 = C^{20}NH^7,H^2$.

ZININ. (1842.) J. pr. Chem. 27, 140; Ann. Pharm. 44, 283; Berz. Jahresb. 23, 545. - Petersb. Acad. Bull. 10, 346; abstr. Ann. Pharm. 84, 346; Chem. Gaz. 1852, 441; J. pr. Chem. 57, 173; Pharm. Centr. 1852, 689; Liebig & Kopp's Jahresb. 1852, 627.

PIRIA. Sull'azione del solfito d'ammoniaca sulla nitronaftalina, Pisa, 1850; Ann. Pharm. 78, 31; N. Ann. Chim. Phys. 31, 217; abstr. Pharm. Centr. 1851, 380; Compt. rend. 31, 488; J. pr. Chem. 52, 56;

Liebig & Kopp's Jahresb. 1850, 500.

BECHAMP. N. Ann. Chim. Phys. 42, 186; abstr. Ann. Pharm. 92, 401; Compt. rend. 39, 26; J. pr. Chem. 62, 469.

Delbos. N. Ann. Chim. Phys. 21, 68; Compt. rend, 24, 1091; N. J. Pharm. 12, 237; Ann. Pharm. 64, 370; J. pr. Chem. 42, 244; Pharm. Centr. 1847, 637; Liebig & Kopp's Jahresb. 1847-8, 610.

W. H. Perkin. Chem. Soc. Qu. J. 9, 8; Chem. Gaz. 1856, 119;
N. Phil. Mag. J. 12, 226; Instit. 1856, 300 and 406; J. pr. Chem.
68, 152 and 441; Chem. Centr. 1856, 394; Liebig & Kopp's Jahresb.

H. Schiff. Prelim. notice: Ann. Pharm. 101, 90; J. pr. Chem. 71, 108; more detailed: Inaugural dissertation, Göttingen, 1857; abstr. Ann. Pharm. 101, 299; J. pr. Chem. 70, 264; N. Ann. Chim. Phys. 52, 112; Chem. Gaz. 1857, 211; Chem. Centr. 1857, 166 and 362; Liebig & Kopp's Jahresb, 1857, 389.

A. W. HOFMANN. Compt. rend. 47, 425; N. Ann. Chim. Phys. 54, 204. SCHÜTZENBERGER & WILLM. Compt. rend. 47, 82; J. pr. Chem. 75,

117; Chem. Centr. 1858, 654; Chim. p. 1, 38.

Naphthalidam (Zinin); Naphthalidine (Piria).

Formation. First prepared by Zinin in 1842, by treating nitronaphthalin with sulphuretted hydrogen, or with sulphuretted hydrogen and ammonia aided by a gentle heat:

$$C^{20}XH^7 + 6HS = C^{20}NH^7,H^2 + 4HO + 6S.$$

2. A thionaphthamate is decomposed by an acid, and the thionaphthamic acid thereby liberated is resolved by water into sulphuric acid and naphthylamine:

the same reaction is produced when a thionaphthamate is distilled with excess of hydrate of lime. (Piria.) - 3. Nitronaphthalin is warmed with excess of ferrous acetate ;

$$C^{20}XH^7 + 12 \text{ FeO} + 2 \text{ HO} = 6 \text{ Fe}^2O^3 + C^{20}NH^7, H^2;$$

or with iron filings and acetic acid (Béchamp); in the last case, phthalamine, C'6H4NO', is simultaneously formed, (Schützenberger & Willm).

— 4. Nitronaphthalin is heated with bisulphide of carbon in a sealed tube to 160°, whereby sulphur is separated. (Schlagdenhauffen, N. J. Pharm. 34, 175.)

Preparation 1. One pt. of nitronaphthalin is dissolved in 10 pts. strong alcohol, the solution saturated with ammonia, whereupon a little nitronaphthalin may remain undissolved, and then saturated with sulphuretted hydrogen, till the whole is dissolved and the solution acquires a dirty dark-green colour. The liquid is then allowed to stand for a day, whereupon sulphur crystallises out, the odour of sulphuretted hydrogen ceases, an odour of ammonia becomes perceptible, and the solution now contains hydrosulphate of naphthylamine which decomposes on distillation. A portion of the alcohol is distilled off, whereupon a large quantity of sulphur is deposited, which causes violent bumping, so that the distillation cannot be continued unless the liquid be decanted from the sulphur; the distillation is now continued till bumping again occurs; and the liquid is again decanted and distilled till the portion remaining in the retort separates into two strata, the lower of which is impure naphthylamine, the upper a solution of naphthylamine in weak alcohol. Or sulphuretted hydrogen alone is passed into the warm alcoholic solution of nitronaphthalin; and after a time, the pale yellow solution is poured off from the precipitate which has been formed, and submitted to distillation, whereupon a thick dirty green oil is deposited (solidifying in crystals on cooling), and the liquid on standing deposits fine needles of naphthylamine.

To purify the product, either of the following methods may be adopted: a. the impure base is distilled, the fluid yellowish distillate then solidifying in a white crystalline mass. Or, b. sulphuric acid is added to the alcoholic liquid, whereby sulphuretted hydrogen is evolved and sulphur and sulphate of ammonia are precipitated, and on the addition of more sulphuric acid, the whole mass solidifies in a paste of sulphate of naphthylamine. This is purified by one or two recrystallisations from alcohol, dissolved in water and supersaturated with ammonia, whereupon the liquid becomes transiently turbid, and after a few minutes

is completely filled with crystals of naphthylamine. (Zinin.)

2. A thionaphthamate, or better still, hydrochlorate of naphthylamine prepared therefrom (p. 99), is distilled with excess of slaked lime.

(Piria.)

3. 20 grammes of nitronaphthalin are warmed for \ hour on a waterbath with tolerably concentrated ferrous acetate containing 40 grammes of iron, in a flask provided with a drawn out tube. The flask is then filled with boiling water, and after the liquid has become clear, it is decanted; if it deposits needles, these are collected, and only the liquid is poured away. After the residue has been several times treated with boiling water, it is collected on a filter and exhausted with alcohol of 863; the alcoholic solution is distilled as rapidly as possible; and the residue is treated with sulphuric acid, whereupon, if the liquid be sufficiently concentrated, the whole solidifies in a crystalline mass of sulphate of naphthylamine. This is purified by recrystallisation from boiling alcohol or better, from boiling water, (since in contact with alcohol the red mass is formed with peculiar facility,) and its hot aqueous solution is decomposed by ammonia (Béchamp). - 4. A mixture of 1 pt. nitronaphthalin (which for this purpose need not be recrystallised from alcohol, but only freed from nitric acid by washing with water: Schiff) with 12 pt. iron filings in sufficient common acetic acid to cover the whole, is gently warmed in a retort capable of containing ten times as much substance, till the nitronaphthalin is melted. It is then taken off the fire, lest the mass should go over. When the violence of the reaction has abated, it is distilled on a sand-bath, the retort being surrounded with sand up to the neck,

whereupon first the acetic acid, and afterwards at about 300°, the naphthylamine passes over and collects under the acetic acid as a yellow liquid, which is purified either by fractional distillation, or as described in method 3. (Béchamp.) Considerable quantities of naphthylamine are thus obtained, but impure; it is therefore dissolved in hydrochloric acid, and the filtrate is evaporated to dryness and distilled with hydrate of lime, whereupon the base passes over perfectly colourless and almost pure. (Perkin.) 5. The operation is conducted as in 4, and after the reaction is terminated, the excess of acetic acid (which always contains a little naphthylamine in solution) is distilled off; the residue when cooled is mixed with rather concentrated potash-solution, and allowed to stand for an hour, in order that the mass may become thoroughly saturated with potash; and the bulb, of the retort is then completely surrounded with ignited charcoal, whereupon the naphthylamine begins to pass over at 300°. It is advantageous to place some acetic acid in the receiver, in order that the vapours may be immediately absorbed. As soon as the distillation is over, the contents of the receiver, which always contains a small quantity of undecomposed nitronaphthalin, are repeatedly boiled with dilute acetic acid, and the naphthylamine is precipitated from the filtrate by potash. White flakes are obtained which impart a turbid, milky appearance to the liquid, and after standing for several hours unite in long needles. (Schiff.)

Purification. Naphthylamine obtained by method 4, (as well as that obtained by method 5, according to Carius), contains an admixture of phthalamine. To purify it, the crude product obtained in the first distillation is treated with sulphuric acid, and the more insoluble sulphate of naphthylamine is separated from the more soluble sulphate of phthalamine by crystallisation from water. (Schützenberger & Willm.)

Properties. Precipitated from the sulphate by ammonia, it forms fine, white, silky needles, pressed flat together; or when precipitated from the acetate by potash, white flakes, uniting in long needles after they have stood for several hours in the liquid. (Schiff.) Melts at 50°, and boils at about 300°, distilling without decomposition, as a pale-yellow, clear liquid, a single drop of which often remains fluid for some time on a watch-glass, but solidifies suddenly when touched. When the liquid is cooled to 0°, it solidifies in a yellowish white crystalline mass. (Zinin.) Carefully and gradually heated, it sublimes in long silky needles (Schiff), and when kept long in a closed vessel between 20° and 30°, in long, narrow, very thin, flexible and transparent laminæ. (Zinin.) It has a peculiar, strong, disagreeable odour, and a strong, pungent, bitter taste; it has not an alkaline reaction. (Zinin.)

C20NH9	100000			99.63
N		 9.79	********	9.21
9 H	9	 6.30	********	6.51
20 C	120	 83.91		83.91
				Zinin.

Decompositions. 1. Heated on platinum-foil, it burns with a very smoky, yellow flame, and leaves a large residue of charcoal (Zinin).—
2. Turns violet in the air (Zinin); exposed to air and light, it turns

yellow, and afterwards brown (Schiff); probably absorbing oxygen at the same time (Zinin). It becomes more rapidly coloured in the liquid form, and hence more especially after distillation, if it be not cooled to 0° and preserved in hermetically sealed vessels. (Zinin.) Sublimed naphthylamine becomes coloured only by prolonged exposure to the air and sun, and if protected from both, may be preserved unchanged for years. (Schiff.) - 3. It is not attacked by chlorine in the cold, but in the melted state it is violently attacked, being thereby converted into a resinous substance, while another portion forms hydrochlorate of naphthylamine with the hydrochloric acid produced, and sublimes in the upper part of the vessel. When the aqueous solution of hydrochlorate of naphthylamine is submitted to the action of chlorine, it assumes a violet colour and deposits a brown resin. No chloride of ammonium is formed in this reaction; but from the solution, which has become strongly acid, a new substance crystallises by spontaneous evaporation in long, transparent, golden-yellow needles. (Zinin.)

4. Naphthylamine, or one of its salts, gives with aqueous ferric chloride, nitrate of silver, chloride of gold, and in general with all oxidising agents, a beautiful, azure-blue precipitate of naphthameine, which rapidly turns purple (Piria); the same reaction is produced by nitrous acid (Ganahl), as well as by, platinic chloride, mercuric chloride, chloride of zinc, bi-chloride of tin, and by chromic acid. (Schiff.) The blue precipitate is not formed, as Piria concluded, from naphthylamine by loss of hydrogen and the elements of ammonia, but consists of oxynaphthylamine, C20H9NO2 (Schiff). The colour acquired by naphthylamine and its salts by exposure to the air is probably due to the formation of the same substance. (Piria, Schiff.) - 5. Naphthylamine, as well as its salts, is converted by nitric acid, especially if it contain nitrous acid, into a brown powder, which is almost insoluble in water, but readily soluble in alcohol, forming a red or violet liquid. It is deposited on evaporation unchanged, and sometimes together with crystals resembling murexid. (Zinin.) (Hence it is probably nitrosonaphthylin; Carius.) - 6. Naphthylamine or one of its salts is converted by nitrous acid or by nitrite of potash, into nitrosonaphthylin, C20H8N2O2 (Church & Perkin), with evolution of nitrogen gas (Schützenberger & Willm); according to Schützenberger & Willm (Compt. rend. 46, 894; J. pr. Chem. 74, 75), it is converted into a brown porous mass which is resolved by alcohol or ether, into nitrosonaphthylin. which dissolves, and an insoluble non-azotised substance, naphthulmin, C20HOO4 (Comp. p. 26.) Naphthylamine suspended in water and treated with natrous acid, yields at first naphthameine, with evolution of gas, and if the action be prolonged, a resin and an acid which dissolves in alcohol with lemon-yellow colour, C18H6N2O8 (xiii, 352) - (Ganahl & Chiozza, Ann. Pharm. 99, 240; J. pr. Chem. 70, 125).

7. When naphthylamine is added by small portions to a mixture of nitric and sulphuric acids, a violent reaction sets in and the whole acquires a dark green colour. Water precipitates from the solution yellowish-red flakes, insoluble in water and hydrochloric acid, soluble with red colour in alcohol, sulphuric acid, nitric acid, and potash, and precipitated from the potash solution by neutralisation and from the other solutions by water; they are probably nitronaphthylamine, CoonXH^a,H^a. From this solution iron and acetic acid precipitate brown flakes of a base resembling in reactions and insolubility Zinin's semi-

naphthylamine C20N2H10. (Schiff.)

8. Naphthylamine heated on a water-bath with oxychloride of phos-

phorus, yields ternaphthylphosphamide and hydrochlorate of naphthylamine.

$$PO^{2}Cl^{8} + 6 C^{20}NH^{9} = N^{3}(PO^{2})(C^{20}H^{7})^{8}H^{3} + 3 C^{20}NH^{9}, HCl.$$
 (Schiff.)

9. When a solution of naphthylamine is anhydrous ether is saturated with gaseous cyanic acid, and allowed to evaporate spontaneously, it yields brilliant yellow laminæ of naphthyl-urea, C²²H¹⁰N²O². This urea is not formed from sulphate of naphthylamine and cyanate of potash, but these substances decompose by prolonged digestion of the concentrated solutions and evaporation in the water-bath, giving rise to naphthylamine, sulphate of potash, and common urea:

$$S^{2}(C^{20}NH^{10})HO^{8} + KO,CyO + 2HO = C^{2}H^{4}N^{2}O^{2} + C^{20}NH^{0} + 2KO,SO^{3} + 2CO^{2},$$
 (Schiff.)

this should perhaps be:

$$S^{2}(C^{20}NH^{10})^{2}O^{8} + 2 KO,CyO + 2 HO = C^{2}H^{4}N^{2}O^{2} + 2 C^{20}NH^{0} + 2 KO,SO^{3} + 2 CO^{2}$$
. (Carius.)

When an ethereal solution of naphthylamine is saturated with gaseous cyanic acid, no naphthyl-urea is formed under certain circumstances, (probably when ether containing water is employed), but a red solution, yielding on evaporation a purple syrupy mass, which is turned violet by acids, and red again by alkalis. Paper saturated with the alcoholic solution gives the opposite reactions to litmus paper; like that formerly prepared by Sace with tincture of madder. These colour-reactions are perhaps connected with the relation of the naphthalin-compounds to the colouring matters of madder. (Schiff.)

colouring matters of madder. (Schiff.)

10. Alcoholic solution of naphthylamine combines with oil of mustard, forming allyl-naphthyl-sulphocarbamide, C²⁸H¹⁴N²S². (Zinin.) — 11. A mixture of naphthylamine and sulphocyanide of phenyl becomes almost immediately solid, phenyl-naphthyl-sulphocarbamide being formed. (A. W. Hofmann.) — 12. An alcoholic solution of naphthylamine yields with bisulphide of carbon, sulphocarbonaphthalide and sulphuretted hydrogen, (Laurent, N. Ann. Chim. Phys. 22, 104; Delbos); and the same reaction ensues when naphthylamine is heated for several hours with bisulphide of carbon in a sealed tube. (Schiff.)

$$2 C^{20}NH^9 + 2 CS^2 = C^{42}N^2H^{16}S^2 + 2 HS.$$

When the vapours of naphthylamine and bisulphide of carbon are passed through a red-hot porcelain tube, much shining charcoal is deposited; and hydrosulphocyanic and hydrosulphuric acids are formed; probably naphtho-sulphocyanic acid, C⁵⁰CyH⁷,S², together with sulphuretted hydrogen, is first formed, and is then resolved in carbon and hydrosulphocyanic acid. (Schlagdenhaufen, N. J. Pharm. 34, 175.)

13. Naphthylamine behaves with chloride of cyanogen like aniline, (Cahours & Cloez, Compt. rend. 38, 354; Ann. Pharm. 90, 91.) If chloride of cyanogen be passed through naphthylamine in the fused state, as in the preparation of melaniline by A. W. Hofmann's method, (xi, 351) heat is developed and a substance is produced which on cooling becomes a black resinous mass, and consists chiefly of hydrochlorate of menaphthylamine. (W. H. Perkin.)

2 C20H9N + C2NC1 = C42NH17,HC1.

14. When naphthylamine is heated with bromide of ethyl for several hours at a temperature between 40° and 50°, so that the vapour formed vol. XIV.

condenses and flows back into the flask, a reddish-brown mass is produced, containing hydrobromate of ethyl-naphthylamine together with excess of bromide of ethyl; the same reaction takes place at the common temperature in about 14 days:

C20NH9 + C4H5Br = C24H13N, HBr. (Schiff.)

15. Naphthylamine and iodide of ethyl form hydriodate of ethyl-naphthylamine. 16. With iodide of methyl, a sticky mass is formed, which cannot be crystallised from either alcohol, water, or ether. (Schiff.) -17. Naphthylamine and aniline do not react upon one another either by distillation or by heating the mixture in a sealed tube in an oil-bath.

Combinations. 1. Almost insoluble in water. (Zinin.) 2. Appears

to combine with iodine. (Zinin.)

Naphthylamine is a strong base, and combines with all oxyocids and hydracids, forming salts, from all of which it is separated by ammonia. The salts of the hydracids are anhydrous, those of the oxyacids contain 1 At. water, which cannot be expelled without destroying the salt. (Zinin.) The salts of naphthylamine are white, and for the most part crystalline. (Zinin.) They turn violet on exposure to air and light (Zinin); they turn yellow, afterwards red, and then brown, (Schiff)— (Zinin); they turn yellow, afterwards red, and then brown, (Schiff)—probably absorbing oxygen (Zinin), and in consequence of the formation of oxynaphthylamine. (Piria, Schiff.) Their solutions give with ferric chloride, nitrate of silver, chloride of gold, and generally with all oxidising agents, a beautiful azure-blue precipitate, rapidly acquiring a purple colour (comp. p. 96): naphthameïn, according to Piria; oxynaphthylamine, C²⁰H⁹NO², according to Schiff; and with chromic acid, a green, blue, or black coloration, according to the concentration of the liquid. (A. W. Hofmann.) They impart a yellow colour to pine-wood, like aniline, only the colour is more intense. (A. W. Hofmann.)

Phosphate of Naphthylamine. a. Ordinary. Even weak solutions of naphthylamine solidify in a mass of acicular crystals with an aqueous solution of unignited phosphoric acid. These crystals are readily soluble in boiling alcohol and in water; the salt crystallises unchanged from the alcoholic solution, but is deposited from the aqueous solution as a mass of white, silvery scales. It turns red in the air more rapidly than the sulphate. (Zinin.)

b. Metaphosphate. An alcoholic solution of naphthylamine gives with alcoholic metaphosphoric acid, a white pulverulent precipitate, which is but very slightly soluble in water and in alcohol. (Zinin.)

Sulphate of Naphthylamine. Naphthylamine dissolves in gently heated oil of vitriol, forming a clear liquid, which yields no erystals even at 0°, but when diluted with water, deposits a large quantity of scaly crystals, so that the liquid becomes solid. The same crystals are obtained by cooling a solution of naphthylamine in dilute sulphuric acid. (Zinin.) If sulphuric acid be added to a solution of thionaphthamate of potash, soda, or ammonia, and the liquid warmed, a crystalline pulp is formed before the liquid begins to boil, provided it is sufficiently concentrated; on continuing the application of heat, the crystals dissolve, and on cooling, silvery laminæ are deposited, which may be purified by repeated recrystallisation from water or from alcohol (comp. p. 93.)

(Piria). White, silvery laminæ, possessing in a great degree the odour and taste of the free base. Reddens litmus. When dry, it does not suffer any change in the air; when moist, or in solution, it turns red like the base. The solution stains the skin first red and then dark brown. (Zinin.) At the temperature of boiling water, it effloresces to a light, mealy, dull powder. Heated in a retort, it melts, decomposes with evolution of sulphurous acid, and leaves a porous, shining charcoal, while part of the base distils over with the water. (Zinin.) It is difficultly soluble in cold water and alcohol; slowly, but rather abundantly soluble in boiling alcohol, so that the saturated boiling solution solidifies completely on cooling. (Zinin.) It is less soluble in water than sulphate of phthalamine, and can therefore be separated from this substance by crystallisation. (Schützenberger & Willm.)

				at 10	Zinin.
20 C	120		62.49		
10 H	10	****	5.21	*******	5.88
N	14		7.29	********	6.50
S	16		8-34		8.39
40	32		16.67		17.23
C20NH9, HO, SO3	192	-	100:00		100:00

Bechamp found in the salts prepared by method 3 (p. 94), 22.812 p. c. SO³; Schützenberger and Willm, in those obtained by method 4, and separated by crystallisation from sulphate of phthalamine, 62.3 p. c. C, 5.3 p. c. H, 20.8 p. c. SO³, and 8.65 p. c. water of crystallisation.

Alcoholic solution of sulphate of naphthylamine yields with iodide of potassium, a precipitate of sulphate of potash; the solution deposits on evaporation a resinous mass containing iodine, burning without residue, and decomposing with hot water. (Schiff.)

Hydrobromate of Naphthylamine. A concentrated alcoholic solution of sulphate of naphthylamine mixed with an equivalent quantity of concentrated solution of bromide of potassium or of barium, yields in the first instance slowly, in the second immediately, a precipitate of sulphate. The coloured filtrate slowly evaporated, leaves a crystalline residue of hydrobromate of naphthylamine, readily soluble in alcohol, but less soluble in cold water. Schiff found in the salt 35.53 p. c. Br; the formula C³NH³, HBr requires 35.72 p. c. Br. (Schiff.) Schiff explains the formation of this salt by the equation:

S2(C20NH10)HO8 + KBr = C20NH9, HBr + S2KHO8,

Hydrochlorate of Naphthylamine. When concentrated alcoholic solution of naphthylamine is mixed with excess of hydrochloric acid, a white, solid mass is produced, which must be carefully freed from moisture by pressure between blotting paper and drying in vacno over oil of vitriol and lime, and afterwards sublimed in a common beaker-glass placed in an oil-bath. (Zinin.)—A tolerably concentrated solution of thionaphthamate of potash, soda, or ammonia, is heated till it nearly boils, pure hydrochloric acid is then added, and the whole is boiled for a few moments. If the solution is very concentrated, a crystalline precipitate of sulphate and hydrochlorate of naphthylamine is formed, even while the liquid is still warm; in this case, a little water must be added and the whole

warmed, till the precipitate redissolves. The sulphuric acid is now precipitated by excess of chloride of barium and the liquid filtered hot; on cooling, hydrochlorate of naphthylamine crystallises out. The mother-liquid yields, on addition of hydrochloric acid, more of the salt, which becomes less soluble therein the more hydrochloric acid is added. (Piria.) Crystallises from alcohol in brilliant scales resembling the sulphate; from water in asbestos-like needles. (Zinin.) Sublimes almost without decomposition (Zinin, Piria); at 200°, in a light, woolly mass, consisting of fine needles (Zinin); in snowy crystalline tlakes (Piria). The sublimed salt is permanent in the air; if moist or in solution, it is rapidly decomposed in the air (Zinin, Piria); it then becomes red more quickly than the sulphate (Zinin), and can no longer be purified by crystallisation from alcohol or from water. (Piria.) Rather soluble in water, more soluble in alcohol and in ether. (Zinin.)

				subl	Zinin, imed (mean).
20 C	120		66.85		66.36
10 H	10	****	5.58		5.74
N	14	****	7.80		
CI	35.5		19.77	******	19.03
C20NH9,HC1	179.5		100.00		

Nitrate of Naphthylamine. Naphthylamine dissolves in boiling dilute nitric acid free from nitrous acid, forming a colourless or slightly red liquid, from which the salt crystallises on cooling in small, brilliant scales. (Zinin.)

Chloromercurate of Naphthylamine. Mercuric chloride produces with alcoholic solution of naphthylamine or of its salts, a yellow curdy precipitate, difficultly soluble in cold alcohol, but completely in boiling alcohol, from which it is deposited in crystals on cooling. (Zinin).

Chloroplatinate of Naphthylamine. When an alcoholic solution of hydrochlorate of naphthylamine is poured into a solution of platinic chloride, the liquid turns green and deposits the salt as a brownish green-yellow powder. Crystallises from the hot solution on cooling; difficultly soluble in water, and still less soluble in alcohol or in ether. (Zinin.)

Dried at 100°, it contains 28.21 p. c. platinum. (Zinin.)

Oxalate of Naphthylamine. a. Neutral. Crystallises in small, thin, silvery laminæ, grouped in stars. (Zinin.) Heated in a retort, it first melts, losing water of crystallisation; shortly afterwards, water and equal volumes of carbonic oxide and carbonic acid are evolved with effervescence, naphthylamine and carbonaphthalide, C¹²N²H¹⁶O², distilling over at the same time:

$$C^{44}H^{20}N^{2}O^{8} = C^{42}N^{2}H^{16}O^{2} + 4HO + 2CO;$$

or better;

 $2 C^{44}H^{20}N^{2}O^{6} = C^{42}N^{2}H^{16}O^{2} + 2 C^{20}NH^{9} + 6 HO + 4 CO + 2 CO^{2}$, (Delbon).

The last named compound is a secondary decomposition-product from exanaphthalide C4N2N48O4. The neutral salt behaves when heated like

the acid salt, only that it yields more free naphthylamine and more oxanaphthalide (Zinin.)

					in vacuo o	ver
20 H 2 N	**************************************	20 28	***		 66·13 5·33	
2(C20)	NH9), C4H2O8	376		100.00		

b. Acid. Crystallises in clumps of dull, white nodules, soluble in alcohol and in water. (Zinin.) Decomposed by dry distillation, yielding a brownish yellow powder, which is insoluble in water, and is deposited from its alcoholic solution unchanged. (Zinin.) Heated to complete fusion, it yields carbonaphthalide:

$$2 C^{24}H^{11}NO^{8} = C^{42}N^{2}H^{16}O^{2} + 6 HO + 4 CO + 2 CO^{2}$$
. (Delbos.)

The well dried substance begins to melt at 200°, then swells up, evolving water and a mixture of 2 vols. carbonic acid and 1 vol. carbonic oxide; after the whole has been completely melted, the liquid residue, which on cooling solidifies in a radiated crystalline mass, consists of oxanaphthalide and formonaphthalide C²²H°NO². (Zinin, Petersb. Acad. Bull. 16,242; Ann. Pharm. 108,228; J. pr. Chem. 74,379.)

24 C			62-18
11 H		********	4.88
8 0			

Appendix to Naphthylamine.

Oxynaphthylamine.

C20NH9O2 = C20NH7,2HO?

Piria. Compt. rend. 31, 488; Ann. Pharm. 78, 31; N. Ann. Chim. Phys. 31, 217; J. pr. Chem. 52, 56; Pharm. Centr. 1851, 380; Liebig & Kopp's Jahresb. 1850, 500.

H. Schiff. Ann. Pharm. 101, 90; J. pr. Chem. 71, 108; Chem. Centr. 1857, 166; Chem. Gaz. 1857, 211; Liebig & Kopp's Jahresb. 1857, 389.

Naphthameine. (Piria.) Oxynaphthalidine.

Formation. 1. A solution of naphthylamine or of one of its salts is treated with an oxidising agent, such as ferric chloride, nitrate of silver, chloride of gold (Piria), or chromic acid, mercuric or stannic chloride, or chloride of zinc; in which reaction neither metal nor chlorine enters into the new compound. (Schiff.) — 2. By the first action of nitrous

acid upon naphthylamine suspended in water, nitrogen gas being evolved. (Ganahl, Ann. Pharm. 99,240.) — The violet colour acquired by naphthylamine and its salts, as well as by the thionaphthamates, on exposure to the air, is probably owing to the formation of oxynaphthylamine. (Piria, Schiff.)

Preparation. Hydrochlorate of naphthylamine is dissolved in alcohol, the solution diluted with water, but not sufficiently to cause turbidity, and while the whole is continuously stirred, aqueous ferric chloride is added, drop by drop, until a slight excess is present. The whole is allowed to stand for an hour with repeated stirring, and the precipitate is then collected, and first washed with water, till the wash-waters cease to become turbid with nitrate of silver, afterwards with alcohol, and then dried in vacuo. (Piria.) — Schiff adopts the same method, or he precipitates sulphate or acetate of naphthylamine with aqueous chromic acid.

Properties. Light, amorphous, dark purple powder (closely resembling Robiquet's orceïn, xii, 358.) (Piria.) When moist, it has a peculiar odour, resembling that of iodine, especially if heated. It cannot be crystallised. (Schiff.)

								Schiff.		
						a.		b.		c.
20 C	*************	120	****	75.47	*******	75:41	****	74.09	****	75.34
9 H	*************	9	****	5.66		5.71	****	5.70	****	5:39
N	***************************************	14	****	8.80	******	8.84				
20		66	****	10.07		10.04				

C20NH9O2 159 100.00 100.00

a was obtained with chromic acid, b with ferric chloride; c was precipitated by water from the sulphuric acid solution. Hence it is a simple product of the oxidation of naphthylamine, and not, as Piria thinks, oxidised naphthylamine minus ammonia.

Decompositions. It melts when heated, and immediately decomposes, evolving an aromatic vapour smelling of naphthylamine; and finally leaves a residue of difficultly combustible charcoal, which, however may be completely burned. (Piria.)—Burns when heated in the air, and leaves a difficultly combustible charcoal. (Schiff.) When moist, or if placed under water, it rapidly becomes violet; hence it is difficult to obtain the dry product of a pure blue colour. (Schiff.)

Combinations. 1. It is insoluble in water.—2. Dissolves in cold sulphuric acid, forming a blue liquid of the colour of indigo-solution, and is precipitated unchanged by water.—3. Insoluble in ammonia and caustic potash. (Piria.)—4. Dissolves sparingly in alcohol, imparting its colour to the liquid. (Piria.)—5. Dissolves abundantly, with purple colour, in ether, and is precipitated from the solution by spontaneous evaporation as an amorphous powder. (Piria.)—6. Dissolves in concentrated acetic acid with violet colour; the solution is not precipitated by water or by tartaric acid, but oxynaphthylamine is precipitated therefrom by most acids, alkalis, and metallic chlorides. (Piria.)

It does not combine with acids or with bases. (Schiff.)

Lepidine.

$C^{20}NH^9 = C^{20}NH^7, H^2.$

GR. WILLIAMS. Edinb. Roy. Soc. Trans. 21, 2nd pt.; Chem. Gaz. 1855, 301 and 325; J. pr. Chem. 66, 334; abstr. N. Ann. Chim. Phys. 44, 491. Further, Edinb. Roy. Soc. Trans. 21, 377; Chem. Gaz. 3rd pt., 1856, 261 and 283; abstr. J. pr. Chem. 69, 355; Chem. Centr. 1856, 817; Liebig & Kopp's Jahresb. 1856, 532.

Isolated by Williams, after Gerhardt had already conjectured its presence in chinoline. (Comp. xiii, 243.)

Formation. 1. By submitting cinchonine to dry distillation. — 2. In the dry distillation of coal, passing over in the coal-tar oil. In either case accompanied by many other bases.

Preparation. 1. From cinchonine. The operation is conducted as described, xiii, 244, and the portion passing over above 270° (between 266° and 271° J. pr. Chem. 69, 363) is purified by repeated rectification.—2. From coal-tar oil. The portions passing over between 250° and 267° C. in the fractional distillation of the bases as described (xiii, 244), are collected apart. The portions which pass over afterwards, i.e. at 274°, contain cryptidine, C²²NH¹¹.

Properties. Oil resembling chinoline. That obtained from cinchonine boils between 266° and 271°, that from coal-tar oil between 252° and 257°, and has asp. gr. of 1.072 at 15°. Both products have the same odour. The vapour density of the first = 5.14, of the second = 5.15, at 15° above the boiling point, but the last was slightly decomposed.

from Cinchonia	ne.		Gr	. Williams.
20 C 120		83.91		83.29
N 14	****	9.80		10.15
9 H 9	mie	6.29	*******	6.57
C ²⁰ NH ⁹ 143	1	100:00		100.01
			-	
	Vol	ls.	Vap	our density.
C-vapour				our density.
	20			and the same of th
C-vapour N-gas H-gas	20			8.3200
N-gas	20 1 9			8·3200 0·9706

According to Williams, lepidine obtained by method 1 is probably only isomeric, and not identical with that obtained by method 2, which is rendered probable by the difference in boiling point (and the different behaviours of their salts).

Isomeric with methyl-chinoline (xiii, 252), and with naphthylamine.

Decompositions. 1. Lepidine 1 is slightly decomposed by boiling, yielding traces of pyrrhol and carbonate of ammonia.—3. The iodides of methyl, ethyl, and amyl, convert it into methyl-, ethyl-, and amyllepidine.

Combinations. Lepidine 1 forms salts, which are crystallisable, but crystallise with difficulty. When bases of lower boiling point are present, the same holds good with lepidine. 2. The salts obtained from the latter smell of naphthalin.

Hydrochlorate of Lepidine. C20NH9, HCl. — Small colourless needles, which do not melt at 100°.

Nitrate of Lepidine. When lepidine which has passed over between 260° and 266° is dissolved in moderately dilute nitric acid, it forms a pale red solution, yielding on evaporation a brownish red deliquescent mass. When this has been purified by repeated pressure and crystallisation from alcohol, it forms hard prisms (yellow, if impure) which are permanent in the air, and do not melt at 100°— Lepidine obtained from cinchonine, and that from coal-tar oil, behave in the same way with hydrochloric acid.

	Pr	G. Williams.				
20 C		120	****	58.25		57.69 to 58.40
10 H		10	***	4.86	*******	4.93 ,, 4.90
2 N		28	****	13.59		
60		48	****	23.30		

C20NH9, NO6HO 206 100.00

Bichromate of Lepidine is obtained by mixing aqueous chromic acid with lepidine, and recrystallising from water the crystalline powder thus formed. Beautiful, long, golden-yellow needles, which decompose at 100°, when moist but not when dry, and leave chromic oxide on ignition. Lepidine, prepared from coal-tar oil, does not form crystals with chromic acid, but only oily compounds.

λ	Teedles.			Gr.	Williams.
20 C		****	47.36	********	47.05
10 H		****	3.95		3-89
2 Cr		****	21.07		21.27
7 0	56	****	22.10	-	

C⁵⁰NH⁶,HO,2CrO³ 253·4 100·00

Concentrated solutions of hydrochlorate of lepidine and chloride of cadmium yield a crystalline compound, corresponding to that formed by hydrochlorate of chinoline (xiii, 215). (Chem. Gaz. 1855, 450; Liebig & Kopp's Jahresb. 1855, 551.)

Chloroplatinate of Lepidine. — Obtained from lepidine passing over between 265° and 271°. If prepared from coal-tar oil, it remains soft for a short time after it has been precipitated, and afterwards becomes crystalline.

				Gr	. Williams.
20 C	120		34.36	*******	34.04
N	14		4.01		
10 H	10	1111	2.86	mires.	2.95
Br	98.7		28.27	*******	28.13
3 Cl	106.5	****	30.50		A CARLOR TO
C#NH#.HCLPtC#	349-2	Marie .	100:00		

Azo-nitroso-nucleus C20N(NO2)H6?

Nitrosonaphthylin. $C^{20}H^{8}N^{2}O^{2} = C^{20}N(NO^{2})H^{6},H^{2}$.

A. H. Church & W. H. Perkin. Chem. Soc. Qu. J. 9, 1; J. pr. Chem. 68, 248; Chem. Gaz. 1856, 139; Instit. 1856, 299; Liebig & Kopp's Jahresb. 1856, 607.

Formation. 1. Formed by reducing binitronaphthalin with nascent hydrogen:

$$C^{20}H^6N^2O^8 + 8H = C^{20}H^8N^2O^2 + 6HO.$$

2. By the action of nitrous acid in naphthylamine :

$$C^{20}NH^9 + NO^8 = C^{20}H^8N^2O^2 + HO;$$

or of nitrite of potash on hydrochlorate of naphthylamine :

In this reaction a large quantity of nitrogen is evolved, and a brown porous mass is formed, which is a mixture of nitrosonaphthylin and naphthulmin (p. 26). (Schätzenberger & Willm, Compt. rend. 46,894, J. pr. Chem. 74,75.) It is also probably formed by the action of nascent hydrogen on nitronaphthylamine. (Church & Perkin.)

Preparation. Nitrite of potash added to hydrochlorate of naphthylamine, yields a precipitate of almost pure nitrosonaphthylin. If the precipitate be washed with water, dried, and extracted with alcohol, and the solution slowly evaporated, the nitrosonaphthylin gradually crystallises out in small needles.

Properties. Small, very dark crystals having a green metallic lustre, like murexid; when precipitated from its alcoholic solution by water, it is scarlet. Melts and sublimes partly, without decomposition. It imparts to alcohol an intense red colour, which is changed to a magnificent violet by acids: alkalis restore the original colour. Cotton wool, linen, paper, &c., may be dyed permanently orange by being dipped into the alcoholic solution of nitrosonaphthylin. When fabrics thus dyed are dipped in acids, they acquire an intense purple-blue colour, rapidly changing to orange in a stream of water.

						Chu	rch & Perkin.
20	C		120	****	69.77		69.76
2	N		28		16.28		16.39
8	H		8	****	4.65	*******	4.80
2	0	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	16	****	9.30	*******	9.05
C20	н	N2O2	179		100:00		100:00

Assuming Laurent's theory of "substitutions nitrosées," nitrosonaphthalin is $C^{20}H^6(NO^2)N$, H^2 = naphthylamine, wherein 1 At. H is replaced by 1 At. NO^2 . The discovery of nitrosonaphthylin and of the analogous nitrosophenylin point to the existence of an entirely new type of substitution-compounds. (Church & Perkin.)

Decompositions. 1. When nitrosonaphthylin is strongly heated, part of it sublimes undecomposed; afterwards white vapours are evolved, and charcoal is left behind.—2. The alcoholic solution appears to decompose gradually; the amount of carbon in the substance thus altered is raised to 75 p. c.—3. Nitrosonaphthylin is destroyed by strong nitric acid.—4. Its colour is not affected by alkalis, but is destroyed by the prolonged action of nascent hydrogen.

Combinations. Insoluble in water and in dilute acids. Dissolves in fuming sulphuric acid with purple-blue colour. Dissolves in alcohol with intense red colour, and is precipitated from the solution by water. Soluble in ether.

Ninaphthylamine.

 $C^{20}H^6N^2O^2 = C^{20}N(NO^2)H^6,H^3$?

CH. S. WOOD. Chem. Gaz. 1859, 218; abstr. Chem. Centr. 1859, 836.

Ninaphthalidin.

Formation. By reducing a weak ammoniacal solution of binitronaphthalin with sulphuretted hydrogen:

 $C^{20}X^{2}H^{6} + 8HS = C^{20}H^{8}N^{2}O^{2} + 6HO + 8S.$

Preparation. Sulphuretted hydrogen is passed through an alcoholic and feebly ammoniacal, boiling solution of binitronaphthalin for about three hours, whereupon the greater part of the alcohol distils off; the residue is then supersaturated with dilute sulphuric acid, heated to hoiling, and filtered. — On cooling, yellowish brown sulphate of ninaphthylamine crystallises out, from the solution of which the base is precipitated by ammonia.

Properties. Beautiful carmine-red needles. It is slightly decompose at 100°. It is a base, and differs totally in properties from the isomeric compound nitrosonaphthylin (p. 105).

Sulphate of Ninaphthylamine. C²⁰H⁶N²O²,SO³,HO. — White scales; decomposed by recrystallisation from its aqueous solution.

Hydrochlorate of Ninaphthylamine. C²⁰H⁶N²O²,HCl. — Acicular crystals.

Chloroplatinate of Ninaphthylamine. C²⁰H²N²O², HCl + PtCl² is precipitated in yellowish-brown, rather soluble crystals when platinic chloride is added to a solution of the base in ether-alcohol.

Amidazo-nucleus C20NAdH6.

Seminaphthylamine. $C^{20}N^2H^{10} = C^{20}NAdH^0,H^2$.

ZININ. (1844.) J. pr. Chem. 33, 29; Ann. Pharm. 52, 362; J. pr. Chem. 57, 177; Ann. Pharm. 85, 329.

Azonaphthylamine, Seminaphthalidine.

Formation. By treating binitronaphthalin with sulphuretted hydrogen and ammonia. (Zinin.)

Preparation. Binitronaphthalin is dissolved in a saturated alcoholic solution of ammonia, and sulphuretted hydrogen is passed through the dark carmine-red solution, till, on complete saturation, it has become greenish-brownish yellow. The liquid is then boiled in a retort, whereupon a large quantity of pulverulent sulphur is deposited; hence in the distillation proper precautions must be taken, as in the case of naphthylamine (p. 94, 1.). When no more sulphur is deposited from the residue in the retort, water is added; and the whole is boiled, filtered boiling, and left to cool, whereupon a quantity of copper-red needles crystallise out. A dark brown, resinous mass, becoming viscid by heat, then remains in the retort, which is several times boiled out with water, as long as the solution continues to deposit crystals on cooling. The crystals are dissolved in hot water, and the filtered solution is left to cool in a well corked flask, whereupon crystals are obtained having an almost metallic lustre, and yellow colour, with copper-red iridescence; by repeated crystallisation from alcohol and water alternately, they may be obtained colourless. The red coloration is due to a resin which is more soluble in alcohol than the base, crystallises from water in fine, dull needles, melts to a red liquid when heated, and distils with partial decomposition, without explosion. (Zinin.)

Properties. Crystallises from alcohol in long and very brilliant needles. It is not affected by a temperature of 100°, melts at 160° to a yellowish-brown liquid, and sublimes in small quantity. Boils above 200°, partly subliming in the neck of the retort, and distilling partly undecomposed, while another part undergoes decomposition, leaves a large residue of carbon, and yields decomposition-products, which impart a brown colour to the sublimate and distillate, and render them impure. Permanent in the air.

					n. Average
20 C	120		75.79	*******	75.60
10 H	. 10	****	6.31	*****	6.31
2 N	. 28		17.90	*******	18.00
C20NAdH8	. 158	****	100.00	*******	99-91

The formula is C¹⁰H⁵N, and from its formation, the atomic weight of binitronaphthalin must be halved. (Zinin.) From binitronaphthalin C²⁰X²H⁶, a compound containing 10 C could not be formed; hence the formula must be C²⁰H¹⁰N. (Laurent, Compt. Chim. 1849, 165.)

Decompositions. 1. The solutions of seminaphthylamine in water, ether, or in alcohol, especially the last, decompose rapidly in the air, becoming turbid and brown, and depositing a brown powder; they then yield only a small quantity of dark brown crystals on evaporation.

2. Heated on platinum foil, it burns with a yellow and very smoky flame, diffusing a not unpleasant odour of naphthalin. — 3. By strong nitric acid it is converted into a violet-brown powder, probably the same substance that is deposited from the solution on exposure to the air. —

4. When chlorine gas is passed through aqueous hydrochlorate of seminaphthylamine, the base is converted into a reddish brown powder, which is almost insoluble in water, but dissolves in hot alcohol with dark carmine colour, and is precipitated unchanged on cooling. — 5. By chlorate of potash (and hydrochloric acid?) it is converted into a similar, but somewhat lighter coloured powder.

Combinations. Dissolves with difficulty in water, forming a pale brownish red solution.

It combines with acids and forms salts; those with oxy-acids contain 2 At. water. Dry seminaphthylamine dissolves in oil of vitriol, forming a dark violet liquid, which remains unchanged for months, but on addition of water instantly solidifies to a reddish white crystalline mass. The alcoholic solution of seminaphthylamine is decolorised by all aqueous acids; the concentrated solution solidifies with sulphuric, phosphoric, or hydrochloric acid in a soft crystalline mass consisting of microscopic white needles or laminæ; ammonia precipitates from the aqueous solution of these crystals, unchanged seminaphthylamine in reddish needles.

Phosphate of Seminaphthylamine. Obtained by mixing the alcoholic solution of the base with aqueous phosphoric acid. It forms brilliant white crystalline scales, more stable than the sulphate. Difficultly soluble in water and in alcohol, crystallising therefrom almost unaltered.

Sulphate of Seminaphthylamine. Moderately dilute sulphuric acid is added to concentrated alcoholic seminaphthylamine, but in such quantity that the free base, which may be recognised by the colour of the liquid, is still present. The white precipitate is washed on a filter with alcohol till the washings are almost colourless, then pressed between blotting paper, dried in vacuo over sulphuric acid, and afterwards in a stream of dry air at 100°. Small, white, scaly crystals; or, when dried, a white, dull powder, permanent in the air. Above 100° it turns red and decomposes. Dissolves with difficulty and with partial decomposition, in water or alcohol; the boiling solution deposits brownish laming on cooling.

					Zinin. at 100°.
20 C	120		46.87		47-09
12 H	12	****	4.69	*******	4.80
2 N	28		10.93		
20	16		6:25		
2 SO3	80	-	31.26		31.00
C20NAdH#.2HO.2SO3	256	1000	100.00		

Hydrochlorate of Seminaphthylamine. To a cold alcoholic solution o seminaphthylamine, moderately strong hydrochloric acid is added drop by drop, and the mixture is cooled, lest it should become heated. The liquid solidifies to a thick white paste of silvery laminæ. These are

washed on a filter with a small quantity of alcohol, pressed between blotting paper, and dried, first in vacuo over sulphuric acid and caustic lime, and then at 100° in a current of dry air. — White crystalline powder which may be preserved unaltered when dry, but decomposes readily in the moist state. It is decomposed by heat, and cannot be sublimed. Sparingly soluble in water and in alcohol; the solutions turn brown in the air.

and.				at	Zinin. 100°, mean
20 C	120	****	51.91	********	51.81
12 H	12		5.19		5.21
2 N	28	2166	12.27		
2 Cl	71		30.63		30.51
C20NAdH8.2HC1	931	4.4	100-00		

Hydrochlorate of seminaphthylamine forms with mercuric chloride an easily soluble compound, crystallising in rather large, white, silvery laminæ.

Chloroplatinate of Seminaphthylamine. Yellowish brown, difficultly soluble powder. The well dried substance leaves on ignition 34:56 p. c. Pt.; $C^{20}N^2H^{10}$, $2HCl + 2PtCl^2 = 34.63$ p. c. Pt.

Seminaphthylamine does not appear to combine with hydrocyanic acid; it does not dissolve more abundantly in the aqueous acid than in water, and crystallises unchanged from its alcoholic solution which has been mixed with concentrated prussic acid.

Aqueous hydrosulphocyanic acid dissolves seminaphthylamine, readily and abundantly, especially when heated; on cooling the solution, bril-

liant white laminæ of the sulphocyanide are deposited.

Oxalate of Seminaphthylamine. White crystalline powder, sparingly soluble in water, and still less in alcohol and ether. The hot solution deposits on cooling brilliant white laminæ.

Tartrate of Seminaphthylamine is prepared like the phosphate. Crystallises in fine, white needles, grouped in the form of stars. Rather soluble in water and in alcohol, sparingly soluble in ether; its solution decomposes; the dry salt is more stable.

Seminaphthylamine dissolves in alcohol and ether with much darker

colour than in water. (These statements of Zinin's refer to coloured seminaphthyl-

amine. Carius.)

Conjugated compounds of C20NH7, or of similar nuclei.

Sulphonaphthylamic Acid.

 $C^{20}NH^9S^2O^6 = C^{20}NH^9,2SO^3$.

LAURENT. Compt. rend. 31, 537; J. pr. Chem. 52, 58; Pharm. Centr. 1851, 157; Liebig & Kopp's Jahresb. 1850, 508.

Acide sulfonaphtalidamique. (Laurent.) Naphtalidinschwefelsäure.

Formation. 1. By treating nitrosulphonaphthalic acid, C20XH2,2SO3, with sulphide of ammoniam. - 2. By gently heating carbonaphthalide, CaN'2H2O2, with oil of vitrol, carbonic acid being evolved: the acid is precipitated on diluting the liquid with water.

 $C^{42}N^{2}H^{14}O^{2} - 4(HO.SO^{2}) = 2 C^{27}NH^{2},2SO^{2}) + 2CO^{2} + 2HO.$

It is uncertain whether this acid is merely isomeric with naphthamic and with naphthionic acid. Can't NH'S'O', or whether it is identical with naphthionic acid. (Carins.)

Naphthionic Acid.

 $C^{x}NH^{3}S^{2}O^{6} = C^{x}NH^{3},2SO^{3}.$

PIRIA. Sulfazione del solvito d'ammoniaca sulla nitronaftalina, Pisa, 1850; Ann. Pharm. 78, 31; N. Ann. Chim. Phys. 31, 217; abstr. Compt. rend. 31, 488; J. pr. Chem. 52, 56; Pharm. Centr. 1851, 380; Liebig & Kopp's Jahresb. 1850, 500.

Formation. Produced, together with the isomeric body thionaphthamic acid, when nitronaphthalin is boiled with sulphite of ammonia. In this reaction the sulphite of ammonia converts the nitronaphthalin (like ammonia and sulphuretted hydrogen), into naphthylamine, which these combines with 2 At. SO's forming about equal proportions of the two isomeric acids. These acids cannot, however, be converted one into the other. (Piria.)

Preparation. 1 pt. nitronaphthalin (prepared by Piria's method, p. 1), and washed with water till the acid reaction ceases, is warmed with 5 pts. alcohol till completely dissolved, and mixed, while the liquid is kept warm, with 5 pts. aqueous sulphite of ammonia of sp. gr. 124. The mixture turns reddish, and then yellow; and, when kept simmering, deposits crusts of acid sulphite of ammonia on the sides of the flask, and becomes acid, whereby the thienapthamic acid is decomposed, and a large quantity of resin is formed, which greatly hinders the formation and purification of the acids. Hence it is necessary, as often as the liquid becomes acid, to add powdered carbonate of ammonia till the crusts redissolve completely, and the solution becomes alkaline. After boiling for eight hours, the decomposition is complete. This may be ascertained by adding a drop of the liquid to water, with which it should produce no The liquid forms two strata, whereof the upper and more considerable stratum contains the decomposition-products of nitronaphthalin dissolved in ammonia—the lower stratum, aqueous sulphate and excess of sulphite of ammonia. The upper stratum is decanted, evaporated over a naked flame to an oily consistence, and allowed to stand in a cool place for 24 hours, whereupon it solidifies in a mass of orange-yellow lamina of thionaphthamate of ammonia. The mother-liquid contains uncrystallisable naphthionate of ammonia; it is heated to 100% and mixed with excess of hydrochloric acid, whereby naphthionic acid is precipitated as a reddish white powder, and sulphurous acid is evolved from the sulphite of ammonia contained in the liquid. The acid is first washed with water, and then with alcohol, till both flow off colourless; and by purifying it completely, it is converted into the lime- or soda-dt. The salt is obtained white by recrystallisation, decomposed with cose of hydrochloric acid, and the naphthionic acid washed as much as

possible out of contact with the air, first with water freed from air by boiling, and then with alcohol. In this way, 200 grammes of nitronaphthalin yield 62.5 grammes of almost pure naphthionate of soda.

Properties. Precipitated from the cold solution of the lime- or sodasalt, it forms a bulky white powder; precipitated from the hot solution, small, light, silky crystals. It is tasteless and inodorous, and has an acid reaction. The crystals part with 1 At. water at 100°, but may be heated to 150° without losing more.

	Cryst	allised.			Piria.
20 C	15	20	. 51.72	*******	51.54
10 H		10	4.31	*******	4.48
N		14	6.03		6.14
28		32	13.80		14.14
70	1	56	24.14	*******	23.70
C20NH9.2SO3+	Ag 23	32	100.00		100.00

Decompositions. Naphthionic acid, especially when moist, is readily decomposed by the air, and by oxidising agents; but presents great stability with most other chemical reagents.—2. Heated on platinum foil, it burns, evolving sulphurous acid and a combustible aromatic vapour, smelling of oil of bitter almonds, and leaving a difficultly combustible charcoal which preserves the form of the substance.—3. It is not affected by dilute nitric acid, but by concentrated nitric acid, especially if containing nitrous acid, or if hot, it is converted into a brown resin resembling that produced by other oxidising agents.—4. Chlorine passed into an aqueous solution of a naphthionate, turns it brown, and finally precipitates a brown resin. Chromate of potash acts in a similar manner, especially if it be mixed with sulphuric acid.—5. Naphthionic acid is neither dissolved nor decomposed by concentrated hydrochloric acid; neither is it attacked by concentrated soda-ley.

Combinations.—1. Dissolves in 2,000 pts. cold water; readily in boiling water, from which it separates in crystals on cooling.—2. Dissolves in sulphuric acid, especially with the aid of heat, and is precipitated therefrom by water unchanged; the solution does not blacken till 220°,

at which temperature it evolves sulphurous acid.

Naphthionic acid is a strong acid; it expels acetic acid from its salts, and readily dissolves in a solution of acetate of potash. The salts of the alkalis are neutral, those of the heavy metallic oxides, acid. Mineral acids precipitate naphthionic acid as a white crystalline powder; acetic acid does not precipitate the aqueous solution, and only partially precipitates the alcoholic solution. It is difficult to obtain the naphthionates free from a red colouring matter; the best way is to recrystallise them from alcohol in the dark. Their solutions exhibit fluorescence like that of quinine, with red, blue, and violet colour; 1 pt. of naphthionate of soda in 200,000 pts. water still exhibits this property. In the solid state, the salts are permanent in the air; the solutions turn red on exposure to air and light, but not in the dark. — Ferric chloride produces with a solution of a naphthionate, a vermilion-red precipitate turning brown by heat; nitrate of silver a white, crystalline precipitate; mercuric chloride, a white precipitate, dissolving by heat, and reappearing as the liquid cools; platinic chloride gives a bright yellow precipitate; chloride of gold imme-

diament time solution purposervit and reduced gold is then precipiment to macrion a produced by second of each coloride of barius, ferrogramme of pomessium, commune of much in matter-emeric.

Minimuments of Farmi. The irrows solution of crude amphibiosis and in moding renormalized twee or times from the smallest possible quantity of kendon. — Small members, silventy released laming, very soluble in water or in kendon, sparsingly solution in kendon or alcoholic potation of the formula of the principal of the formula Cantains 14 54 p. 1. K. and 11 57 p. 1. K. and 12 55 p. c. K.

Virginia mate of immonia is exceedingly soluble in water and in alcohol, and crystallises with difficulty.

Naphthonize of Side. The mude will is heated with powdered carbonate if soin and a limit are not if \$60 p. c. the solution filtered boiling, and allowed to stand for \$10 or \$12 aparts, whereupon it deposits map-thiomate if soin in beautiful harre, transparent and but slightly coloured. prisms. The mother-liquid webis in evaporation more of the salt, but coloured. The crude salt is powdered washed in a funnel with concontrated alcoholic soin which lisselves the resinous matter very effectnaily, but not the salt, and the residue is repeatedly recrystallised with animal chargoal from a small quantity of weak boiling alcohol, till colou-less crystals are obtained.—Large, well leaned prisms of the oblique-prismatic system, or, when crystallised from water, ill-defined, indeterminable forms, containing apparently more water of crystallisation. When com-pletely freed from water of crystallisation by heat, it reabsorbs it in moist air, and appears unchanged when dissolved in water, but does not dissolve in alcohol till it has been boiled for a long time, and this solution deposits on cooling a mass of small, ill-lefthed, caulidower-like crystals, which are presently converted into thick prisms of the original form: Fig. 81 with h-faces; $i:u=115^\circ.56'$: $i:h=96^\circ.34'$: $u:u=111^\circ.55'$. Ratio of the axes, a:b:c=1:0.760:0.014. — Viewed in masses, it is always slightly yellow. In dry air it does not undergo any change, or lose any water of crystallisation. The solution turns reldish brown in the air, especially in sunshine. Dissolves readily in water and in alcohol, but not in other, and but slightly in alkaline water or alcohol; hence its saturated solution is completely precipitated by solutions of the fixed alkalis. Its tasto is at first scarcely perceptible, but after a time it is sweet and persistent.

	Crystalli	sed.			Piria. mean.
20 C	120		37.85	•••••	37.56
16 H	16		5.02	****	5.23
Na	23		7.26	••••	7.15
N	14		4.42		4.20
2 5	32		10.09	••••	9.76
110	112	•	35.33		35.80
C'NNaH'S-O' + 8Ac					

Contains 8 Ats. water of crystallisation, whereof 7 At. 20:00 p a (average), by calculation 19:87 p. c. are expelled at about 80°, and the 'ehth atom, 2:67 p. c. at about 130°. (Piria.)

Naphthionate of Baryta is prepared: 1. By dissolving the acid in baryta-water and removing the excess of baryta by carbonic acid; it is then generally coloured deep red by a resinous substance, and must be purified by washing with cold alcohol, dissolving in boiling water, treating with animal charcoal and crystallising. — 2. (better than 1). 2 pts. crystallised naphthionate of soda and 1 pt. chloride of barium are dissolved in 10 pts. boiling water. As the solution cools, the salt immediately crystallises in a tolerable state of purity, and may be freed from every trace of chloride of barium by two recrystallisations from a small quantity of boiling water. - Crystallises in two different forms, depending on the temperature, and probably with different amounts of water of crystallisation. From rather concentrated solutions, micaceous, white, slightly amethystine laminæ are deposited while the liquid is still warm. The dilute solution does not crystallise till it is quite cold, and then deposits large, transparent, rhombic laminæ, resembling the lime-salt with which they are probably isomorphous. The last-named crystals effloresce very rapidly, become opaque before they are dry, and even when they are placed in alcohol or in water heated above 30°. It is rather soluble in water.

Naphthionate of Lime. Crude naphthionic acid is heated to boiling with milk of lime, and the filtered solution is evaporated on a water bath and allowed to stand from 12 to 24 hours, whereupon large, reddish crystals are deposited. The mother-liquid when evaporated yields more crystals, but more highly coloured. Of all the naphthionates this is the most easy to purify, viz. by washing the powdered salt on a funnel with cold alcohol, and then recrystallising it from boiling alcohol after previous treatment with animal charcoal.

White tablets having a fatty lustre, imperfectly transparent, appearing colourless singly, but rose-coloured when viewed in masses. When dry it is unaffected by the air, but its aqueous solution becomes coloured. Readily soluble in water, almost insoluble in alcohol. Neutral to test papers. Fig. 86 with a- and f-faces, without m. $i:u \& u' = 124^{\circ} 19'$; $i:f = 115^{\circ} 41'$; i:a = 116' 30'; $i:h = 59^{\circ} 30'$; $u:u' = 117^{\circ} 4'$. Ratio of the axes, a:b:c = 1:1:355:1:662. The crystals are mostly reversed twin-crystals with curved faces, in which the inclination of the two i-faces is about 172° 44'.

	Crystallis	ed.			Piria. mean.	
20 C	120		38.22		38.13	
16 H	16		5.10		5.14	
Ca	20		6.37	*******	6.33	
N	14		4.46		4.58	
2 S	32	****	10.19			
14 0	112	***	35.66			
C20NCaH8S2O6 + 8Aq	314	-	100.00			ī

Gives off 7 At. (calculation = 20.05 p. c.) water of crystallisation at 100° , and the 8 At. between 100° and 160° (calculation = 2.86 p. c.); Piria found an average of 20.00 p. c. and 2.78 p. c. water.

Naphthionate of Magnesia is obtained by boiling 1 pt. of carbonate of magnesia with 2 pts. crude naphthionic acid for two hours. As the filtered solution cools, it deposits deep red needles, which may be freed from the VOL. XIV.

greater part of the colouring matter by repeated recrystallisation from boiling weak alcohol. Crystallises in two different forms, containing different quantities of water of crystallisation, depending on the temperature. a. From concentrated solutions it crystallises on cooling in long prisms probably belonging to the square prismatic system, and having their extremities bevelled with two faces. They contain 3.92 p. c. Mg. and give off 23.15 p. c. water at 150°; hence they are probably $C^{20}NMgH^8S^2O^6 + 8$ Aq. (calculation = 3.92 Mg. and 23.52 p. c. Aq.). The crystals rapidly become opaque in the air, from absorption of water. — b. The mother-liquid from a, evaporated spontaneously or in vacuo, yields beautiful, large, red, oblique prismatic crystals; Fig. 91 with f-& t-faces . u: $u' = 76^\circ$ 22'; $i: t = 132^\circ$ 51'; i: u and $u' = 114^\circ$ 57'; $i: f = 77^\circ$ 43'; Permanent in the air; becomes opaque in hot water, loses only part of its water of crystallisation at 100°, but the whole at 150° in all 27.56 p. c.; hence its formula is $C^{20}NMgH^8S^2O^6 + 10$ Aq. (By calculation 27.78 p. c. water.)

Naphthionate of Zinc. 2 pts. naphthionate of soda are dissolved with 1 pt. sulphate of zinc in a small quantity of boiling water. On cooling (sometimes the cold liquid requires stirring), large nacreous lamine crystallise out, resembling naphthalin, and are purified by first crystallising from alcohol and then from water.—Rather long, transparent, red, rhombic lamine; or when crystallised by cooling the hot alcoholic solution, short, four-sided prisms. Becomes opaque at 90°, but not anhydrous till it has been long heated in a stream of air between 150° and 160°. At a higher temperature, it is decomposed, yielding an aromatic vapour and afterwards sulphurous acid. Dissolves readily in water, and in absolute alcohol, especially when heated.

Naphthionate of Lead. Acetate of lead and naphthionate of soda do not react upon one another. — A solution of nitrate of lead in hot, concentrated, aqueous naphthionate of soda, deposits on cooling short, red needles grouped about a common centre, or small granules. Its aqueous solution turns red when boiled, and cannot afterwards be made to crystallise. Reddens litmus. Dissolves slightly in water, but not in alcohol. In dry air at 150° it parts with 5·15 p. c. water of crystallisation; 2 At. = 5·24 p. c. water,

Cuprous Naphthionate? A solution of naphthionate of soda turns red on addition of sulphate of copper. If the excess of sulphate of copper be precipitated by alcohol, and the liquid evaporated in vacuo, an uncrytalline, reddish-brown residue is left, the aqueous solution of which gives with potash a precipitate of hydrated cuprous oxide.

Naphthionate of Silver. Solution of naphthionate of soda produces with perfectly neutral nitrate of silver, a white precipitate, which at first redissolves but afterwards becomes permanent, being converted into a light, white, curdy powder. The salt sometimes remains in this state, and sometimes is rapidly converted into small, heavy, granular crystals of adamantine lustre. It is slightly soluble in water, especially in het water from which it crystallises on cooling. It turns grey on exposure without suffering further change. It yields by heat the same

without suffering further change. It yields by heat the same roducts as the other naphthionates, and leaves metallic silver th exceedingly incombustible charcoal.

Crystallised	or an	orpi	hous.	Piria.	
20 C	120	****	34.48	 34.35	
10 H	10	****	2.88	 3.04	
Ag			31.03	 31.38	
N		****	4.02	 4.16	
2 \$		***	9-20	 9.22	
80	64		18.39	 17.85	
C20NAgH8S2O6+2Aq	348	****	100.00	100.00	

It parts with 5.23 p. c. water of crystallisation at 120°; 2 At. = 5.17 p. c.

Naphthionate of Silver with Ammonia. Naphthionate of silver gives with hot aqueous ammonia, a clear solution, which, on cooling, deposits whitish grey granular crystals. Resembles the silver-salt, and is very little affected by light. Decomposes by heat, with evolution of ammonia.

					Piria.	
20 C	120	****	31.41	******	31.70	
16 H	16		4.19		4.33	
Ag	108	****	28.27	*******	28.85	
3 N	42	****	10.99	******	10.76	
2 S	32	****	8.38			
8 O	64	-	16.76			
ON H3 C20NA - USC206 . GA -	200	1111	100.00			

2NH3,C20NAgH8S2O6+2Aq.... 382 ..., 100.00

Naphthionic acid is barely soluble in alcohol.

Thionaphthamic Acid.

 $C^{20}NH^{9}S^{2}O^{6} = C^{20}NH^{9}, 2SO^{3}(?).$

PIRIA. (1850.) Sull'azione del solfito d'ammoniaca sulla nitronaftalina, Pisa, 1850; Ann. Pharm. 78, 31; N. Ann. Chim. Phys. 31, 217; abstr. Compt. rend. 31, 488; J. pr. Chem. 52, 56; Pharm. Centr. 1851, 380; Liebig & Kopp's Jahresb. 1850, 500.

Formation. Obtained as impure thionaphthamate of ammonia, in orange-yellow laminæ, together with the isomeric compound, naphthionic acid (p. 110), and in about equal quantity, by boiling nitronaphthalin with sulphite of ammonia. The mother-liquid contains the naphthionate of ammonia

Thionaphthamic acid cannot be separated from the ammonia-salt without undergoing decomposition, being converted on the addition of acids, even of cold acetic acid, into sulphate of naphthylamine, which crystallises out.

The thionaphthamates crystallise in large, reddish or amethyst-red, nacreous laminæ. Their solution rapidly turns brownish red in the air, owing doubtless to formation of oxynaphthylamine (p. 101), by the oxidising agency of the air upon the naphthylamine. (Piria.) This decomposition is especially promoted by the action of heat and light;

alkalis retard it; hence the salts are obtained with less colour when they are crystallised from solutions containing a slight excess of alkali. In a state of perfect purity, the salts are probably colourless. (Piria) From 1 At. salt, 2 At. sulphuric acid are thus liberated, of which only 1 At. is neutralised by the naphthylamine; hence free sulphuric acid is formed, which hastens the decomposition. If the solution of the perfectly neutral ammonia-salt be heated to between 80° and 90°, and the evaporated water replaced, it becomes coloured, deposits a melted brown resin, turns very acid, and then contains sulphate of naphthylamine. The potash-salt to which a little caustic potash has been added, it is not decomposed by similar treatment. The salts, distilled with excess of hydrate of lime, yield oily naphthylamine which afterwards crystallises.

Thionaphthamate of Ammonia. Obtained in crystals by dissolving the crude salt in 2 pts. boiling water containing a few drops of ammonia (p. 110) and cooling the solution.—Small, reddish, micaceous lamine, the solution of which becomes more rapidly coloured than that of the other salts. Dissolves very readily in water and in alcohol.

Thionaphthamate of Potash. The aqueous ammonia-salt is boiled with a slight excess of carbonate of potash, till ammonia ceases to be evolved; on cooling, broad, nacreous laminæ, resembling boracic acid, crystallise out. These crystals cannot be obtained perfectly colourless, even by recrystallisation with animal charcoal. — It does not lose weight in a stream of air at 150°. Dissolves very readily in pure water, and but very slightly in water containing potash or carbonate of potash; it scarcely dissolves in alcohol, and very slightly in dilute alcohol.

		Cry	stallised	7.			Piria.
20	C	***************************************	120		45.97		45.84
8	H		8	****	3.06	********	3.22
	K		39.2		14.98		14.83
	N		14		5.36		5.53
2	S		32		12.26	*******	12.24
6	0		48	****	18-37	*******	18:34
C20	NI	KH8S2O6	261.2		100.00	********	100.00

Thionaphthamate of Soda is prepared in exactly the same manner as the potash-salt. Crystallises in reddish micaceous laminse. Dissolves slightly in cold and readily in hot water, and very slightly in water containing carbonate of soda.

Thionaphthamate of Baryta. Reddish micaceous lamine, which crystallise out on mixing boiling concentrated solutions of thionaphthamate of potash and chloride of barium.

	(rystals				Piria.
20 C		120	****	37.75	********	37-32
11 H		11		3.46	******	3.78
Ba	***************************************	68.5	****	21-59	*******	21:45
N		14	****	4.41		
28		32	4434	10.07	*******	10.04
90		72	406	22:72		

C99NBaH8S2O6+3Aq 317.5 100.00

Loses at 120°, 8.53 p. c. water of crystallisation (3 At. = 8.5 p. c.). (Piria.)

The lime- and magnesia-salts resemble the other salts, and are very

soluble.

Thionaphthamate of Lead. Nitrate of lead is added to excess of the boiling concentrated solution of the potash-salt (if an excess of nitrate of lead be added, a double-salt is formed, containing apparently equal number of atoms of thionaphthamate and nitrate of lead). The salt which is deposited on cooling is purified by recrystallisation.—Light, reddish, crystalline powder, dissolving very slightly in water, and scarcely at all in alcohol.

Thionaphthamate and Acetate of Lead. When almost boiling concentrated solutions of thionaphthamate of potash and acetate of lead acidulated with acetic acid, are mixed together, this double-salt crystallises out on cooling, in reddish, nacreous laminæ grouped about a common centre. Gives with sulphuric acid, acetic acid and the ordinary decomposition-products of thionaphthamic acid. Heated in dry air, it does not part with any water. Slightly soluble in cold, more soluble in hot water.

	Cryst	allised.			Piria.
24 C	14	4	29.51		
11 H		1	2.25		
2 Pb	20	7.4	42.42		42.07
N	1	4	2.87	*******	2.99
28	3	2	6.56	*******	6.53
10 0	8	0	16-39		

C30NPbH8S2O6+C4H3PbO4...... 488.4 100.00

Formylnaphthalide.

 $C^{22}H^9NO^2 = C^{20}(C^2H)AdH^6,O^2$?

ZININ. Petersb. Acad. Bull. 16, 282; Ann. Pharm. 108, 228; J. pr. Chem. 74, 379; Rep. Chim. pure 1, 148.

Formation. Compare oxalate of naphthylamine a and b (p. 100.)

Preparation. Well dried acid oxalate of naphthylamine, C²⁰NH², C⁴H²O³, is heated in a retort carefully and gradually to about 200°; whereupon it melts and evolves with effervescence, water and a mixture of 1 vol. carbonic oxide with 2 vols. carbonic acid. After the whole has been completely melted, it is left to cool, whereupon the liquid product solidifies in a radiated crystalline mass, generally amounting to two-thirds of the salt employed. This is treated with alcohol, which dissolves formylnaphthalide and leaves insoluble oxynaphthalide, C⁴H¹⁶N²O⁴

Properties. Crystallises on cooling from boiling water in long silky

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needles. Melts at 102°, and distils almost entirely without decomposition. It acquires a slight rose tint in the air, especially when moist.

22 C	132		77-19	••••	Zinin. 77·14	
9 H	9		5.26	****	5:34	
N 2 O	14 16	}	17.55			
C20(C2H)AdH6.O2	171		100.00			

Decompositions. 1. Aqueous and even dilute boiling potash readily decomposes it into naphthylamine and formic acid. 2. It is easily decomposed by strong acids with aid of heat.

Dissolves somewhat readily in boiling water, and very readily in alcohol.

Methyl-lepidine.

 $C^{22}NH^{11} = C^{20}(C^{2}H^{2})NH^{6}H^{2}$

GR. WILLIAMS. J. pr. Chem. 66, 340.

Formelepidin.

Obtained in crystals in combination with hydriodic acid, like hydriodate of methyl-chinoline (p. xiii, 252).

Isomeric with ethyl-chinoline and cryptidine.

Naphthalocyanic Acid.

 $C^{22}NH^{\dagger}O^{2} = C^{00}CyH^{\dagger},O^{2}.$

- V. HALL. N. Phil. Mag. J. 17, 304; Chem. Gas. 1858, 477; Liebig & Kopp's Jahresb. 1858, 350.
- A. W. Hofmann. Compt. rend. 47, 425; N. Ann. Chim. Phys. 54, 204.

Cyanate of naphthyl.

Formation and Preparation. When carbonaphthalide (p. 125) is heated with phosphoric anhydride, a small quantity of cyanate of naphthyl passes over, while the greater part of the compound is charred. (Hall.) — 2. Menaphthoximide (p. 128) heated to 260° decomposes, puffing out white vapours, which have a very strong peculiar odour, and probably contain naphthalocyanic acid corresponding to anilocyanic acid. (Perkin, Chem. Soc. Qu. J. 9, 8.)

Properties. Magnificent and very fusible crystals. With chemical reagents, it gives reactions precisely analogous to those of anilocyanic acid. (Hofmann.)

Insoluble in water, very soluble in alcohol and in ether.

Naphthalosulphocyanic Acid.

$C^{22}H^{7}NS^{2} = C^{20}CyH^{7},S^{2}.$

V. Hall. N. Phil. Mag. J. 17, 304; Chem. Gaz. 1858, 477; Liebig & Kopp's Jahresb. 1858, 350.

A. W. Hofmann. Compt. rend. 47, 425; N. Ann. Chim. Phys. 54, 204.

Sulphocyanide of naphthyl.

Formation and Preparation. By distilling sulphocarbonaphthalide, C40CyNH14,H2S2. with phosphoric anhydride:

Sulphocarbonaphthalide, obtained by digesting crude naphthylamine with bisulphide of carbon, is pure enough for the purpose. (Hall.)

Properties. Splendid, readily fusible crystals, having a peculiar odour. (Hall.)

Decompositions. 1. Boiled in alcoholic solution with naphthylamine, it again forms sulphocarbonaphthalide, which, from its insolubility in alcohol, may be easily separated from the naphthalosulphocyanic acid.

— 2. With aniline it forms sulphocyanide of phenyl-naphthylamine, C²⁰(C¹²H⁵)CyAdH⁵,H²S². (Hall, Hofmann.)

Insoluble in water, readily soluble in alcohol and in ether.

Naphthyl-urea.

$C^{22}N^2H^{10}O^2 = C^{20}CyAdH^6,H^2O^2$

H. Schiff. Dissertation, Göttingen 1857; J. pr. Chem. 70, 264; Ann. Pharm. 101, 299; N. Ann. Chim. Phys. 52, 112; Chem. Gaz. 1857, 211; Chem. Centr. 1857, 166 and 362; Liebig & Kopp's Jahresb 1857, 389.

Naphthalidinharnstoff; Naphthylharnstoff; Naphthylcarbamid. (Schiff.)

Formation. From naphthylamine and cyanic acid (p. 97, 9), but not from sulphate of naphthylamine and cyanate of potash.

Preparation. Solution of naphthylamine in anhydrous ether is saturated with gaseous cyanic acid (prepared by heating cyanuric acid), and left to evaporate spontaneously, whereby brilliant laminæ of the compound are obtained. In making this experiment, decomposition once took place, giving rise to a purple-red substance; probably owing to the presence of water in the ether (comp. p. 97, 9).

Properties. Brilliant laminæ; or when obtained by evaporating the alcoholic solution by heat, flat, brilliant, flexible needles. It retains a yellowish tint even after several recrystallisations.

C20C+A	dH6,H2O2	186		100:00		100-00
20		16	****	8.61		9.45
						5.45
	M1111111111111111111111111111111111111				*******	70.75
						Schiff.

Decompositions. 1. Decomposed by acids. — 2. With nitric acid the solution evolves gas, and forms a blood-red liquid.

Combinations. It is scarcely soluble in water, and insoluble in alkalis.—2. Dissolves sparingly in ether, but readily in alcohol.—3. Its concentrated alcoholic solution mixed with oxalic acid, yields a crystalline compound.

Ethyl-naphthylamine. C²⁴NH¹³ = C²⁰(C⁴H⁵)NH⁶,H².

Schiff. Notice by Limpricht: Ann. Pharm. 99, 117. — J. pr. Chem. 70, 264; Ann. Pharm. 101, 299; N. Ann. Chim. Phys. 52, 112; Chem. Gaz. 1857, 211; Chem. Centr. 1857, 166 and 362; Liebig & Kopp's Jahresb. 1857, 389.

Vinenaphthalidin. (Gm.)

Known only in combination with hydrobromic and hydriodic acids.

Formation. When naphthylamine is treated for a long time with excess of bromide of ethyl between 40° and 50°, hydrobromate of ethyl-naphthylamine is formed, from which potash liberates the ethylnaphthylamine, which at the same time decomposes.

Hydrobromate of Ethyl-naphthylamine. Purified naphthylamine mixed with excess of bromide of ethyl in a small flask (provided with an upright tube so as to condense the vapours and allow them to flow back) is heated for several hours to the boiling point of bromide of ethyl; the excess of bromide is then distilled off from the resulting reddish brown mass, and the residue is extracted with boiling water. The compound crystallizes from the cooling extracts, and is purified by recrystallisation:

2. Naphthylamine sealed up in a glass tube with bromide of ethyl, yields in a few days, at ordinary temperatures, a small quantity of crystals, and after 14 days, the tube is almost completely filled with them. Pale, rose-coloured, small needles, grouped about a common

centre; they become less readily coloured in the air than naphthylamine. With potash, it forms a white curdy precipitate of naphthylamine, which after a time is converted into needles; at the same time alcohol is formed:

Very slightly soluble in cold water, rather soluble in hot water, alcohol, and ether.

					Schiff.
24 C	144	****	57.14		
14 H	14	****	5.56		
N	14		5.56		
Br	80	****	31.74	*******	31.55
C30(C4H5)NH8,HBr	252		100.00		

Hydriodate of Ethyl-naphthylamine is obtained from naphthylamine and iodide of ethyl, and crystallises in brilliant four-sided prisms. It is much more easily decomposed than hydrobromate of ethyl-naphthylamine; and has about the same solubility as the latter.

Ethyl-lepidine.

$C^{24}NH^{13} = C^{20}(C^4H^5)NH^6,H^2.$

GR. WILLIAMS. Edinb. Roy. Soc. Trans. 21, 3rd pt., 377; Chem. Gaz. 1856, 261 and 283; J. pr. Chem. 69, 355.

Vinelepidin. (Gm.)

If 1 At. more hydrogen be supposed to be added to this compound, it becomes ethyl-lepidine-ammonium. Known only in combination with acids.

Obtained as hydriodate of ethyl-lepidine in the same manner as the hydriodate of methyl- or ethyl-chinoline (xiii, 252, 254) in brown needles, which after recrystallisation exhibit a beautiful canary-yellow colour, become transiently blood-red at 100°, and have the formula C²⁴H¹³N,HI.

Chloroplatinate of Ethyl-lepidine. Obtained in the same manner as the chloroplatinate of methyl-chinoline (xiii, 252). It is soft at first, but soon becomes crystalline. It must be washed with ether alcohol.

					Gr.	Williams.
24 C		144		38.14		38-00
N		14		3.71		
14 H	***************************************	14	****	3.71	*******	3.82
Pt		99		26.23		26.53
		106.5		28-21		

C24NH19, HCl, PtCl2 377.5 100.00

Allyl-naphthyl-sulphocarbamide.

C28H14N2S2 = C20(C6H6)CyAdH6,H2S2.

ZININ. Petersb. Acad. Bull. 10, 346; abstr. Ann. Pharm. 84, 346; J. pr. Chem. 57, 173; Chem. Gaz. 1852, 441; Pharm. Centr. 1852, 689; Liebig & Kopp's Jahresb. 1852, 627.

Senföl-Naphtalidin.

Formation. Naphthylamine combines with oil of mustard, like ammonia.

Preparation. If 30 pts. oil of mustard be added to 43 pts. naphthylamine, dissolved in 344 pts. alcohol of 90 p. c., the greater part of the compound (51 pts.) is gradually deposited in radiated, hemispherically grouped crystals, which soon form a crust; the mother-liquid evaporated to half its bulk yields 18 pts. more product.

Properties. Melts at 130° to a clear, colourless liquid, which on cooling solidifies in a granular crystalline mass. Carefully heated, it distils for the most part undecomposed, as an oily, colourless or slightly yellow liquid, which when cool does not crystallise in granules till it has stood for some time. Neutral.

							Zinin.
							mean.
28	C	***************************************	168		69.42		69.66
14	H		14		5.79	********	5.95
2	N		28	****	11-57		
2	8		32		13.22		13.00

C20(C6H2)CyAdH3,H2S2.... 242 100.00

Decompositions. Dissolves in nitric acid of sp. gr. 1.36, without coloration, if carefully heated, but is soon decomposed, with violent evolution of red vapours, the liquid turning yellow; water then precipitates a yellow resin. If the solution be still boiled till no more red vapours are evolved, water precipitates from the liquid an orange-yellow powder, dissolving readily in alcohol and in nitric acid, but sparingly in boiling water; heated on platinum foil, it melts to a brownish red liquid, and then burns with deflagration, leaving a large residue of carbon.—

2. Treated with hydrated oxide of lead, it parts with its sulphur, and forms a new substance crystallising from hot alcohol in white silky granules. More of these granules are precipitated from the mother-liquid by water, as well as an unctuous substance much more soluble in alcohol than the body granules.

Amyl-lepidine.

C20NH10 = C20(C10H11)NH6,H2.

GR. WILLIAMS. J. pr. Chem. 66, 340.

When lepidine is heated with iodide of amyl for several hours is a scaled tube at 100°, hydriodate of amyl-lepidine is obtained in small crystals containing 37.49 p. c. iodine, and but slightly soluble in water. (By calculation 37.24 p. c. iodine.)

Sulphocyanide of Phenyl-naphthylamine. $C^{34}H^{14}N^{2}S^{2} = C^{20}(C^{12}H^{6})CyAdH^{6},H^{2}S^{2}$.

A. W. Hofmann. Compt. rend. 47, 425; N. Ann. Chim. Phys. 54, 205.

Phenyl-naphthyl-Sulphocarbamide. (Hofmann.) Sulfocyanphenyl-naphtalidin.

Formation and Preparation. 1. When naphthylamine is mixed with sulphocyanide of phenyl, the two bodies unite almost immediately to a solid compound (Hofmann):

 $C^{12}CyH^5S^2 + C^{20}NH^9 = C^{20}(C^{12}H^5)CyAdH^5,H^2S^2$.

2. Naphthalosulphocyanic acid forms the same compound with aniline. (Hall, N. Phil. Mag. J. 17, 304.)

Properties. Crystallises from its boiling solution in spangles; very like sulphocarbanilide, C**CyNH**,H**S**.

Very sparingly soluble in alcohol and in ether.

Conjugated compounds containing 2 At. Con H.

Carbonaphthalide.

 $C^{42}H^{16}N^2O^2 = C^{40}CyNH^{14},H^2O^2.$

Delbos. N. Ann. Chim. Phys. 21, 68; Compt. rend. 24, 1091; N. J.
Pharm. 12, 237; Ann. Pharm. 64, 370; J. pr. Chem. 42, 244;
Pharm. Centr. 1847, 637; Liebig & Kopp's Jahresb. 1847-8, 610.
Zinin. Petersb. Acad. Bull. 16, 282; Ann. Pharm. 108, 228; J. pr. Chem. 74, 279; Rep. Chim. pure. 1, 148.

Naphthalidam-Carbamid, (Delbos.)

Formation. (Comp. p. 100; oxalate of naphthylamine a and b.) — 2. By boiling sulphocarbonaphthalide with alcoholic potash (Delbos):

C42H16N2S2 + 2HO = C42H16N2O2 + 2HS.

3. Oxanaphthalide is heated for a long time above its melting point or submitted to dry distillation, whereupon almost pure carbonic oxide is evolved. (Zinin.)

Preparation. 1. When neutral oxalate of naphthylamine is fused in a retort, it evolves water of crystallisation, and almost immediately decomposes, whereupon water, carbonic acid, and carbonic oxide are evolved with effervescence, and at a higher temperature naphthylamine and carbonaphthalide distil over, the latter condensing for the most part in the neck of the retort. The distilled yellowish mass is freed from naphthylamine by repeated boiling with alcohol, which leaves a residue of pure carbonaphthalide. It would be more advantageous to

interrupt the distillation immediately after the evolution of carbonic oxide and carbonic acid, since a large quantity of carbonaphthalide is decomposed by distillation; but then a product would be obtained contaminated with undecomposed oxalate of naphthylamine. (Delbos.)—2. Best method: Acid oxalate of naphthylamine is heated till it melts completely, and is purified as in method 1 (also from simultaneously formed naphthalide and undecomposed oxanaphthalide). (Delbos, Zinin.)

Properties. Pure white, light, and slightly silky mass. Distils above 300, undergoing partial carbonisation. Turns rapidly red in the air. (Delbos.)

			dr	Delbos. ied at 100°.
42 C	16 28	 80·76 5·13 8·98 5·13	********	80·17 4·98
C40CyNH14,H2O2	312	 100.00		

Decompositions. 1. Distilled with phosphoric anhydride, it yields amongst other products, a small quantity of naphthalocyanic acid (p. 118.) (Hall, N. Phil. Mag. J. 17, 304.) 2. It is not affected by dilute acids. (Delbos.) — 3. Dissolves without decomposition in alcoholic potash, and is precipitated therefrom by water. (Delbos.)

potash, and is precipitated therefrom by water. (Delbos.)

Insoluble in water. Dissolves very sparingly in boiling alcohol (lem than oxanaphthalide, Zinin), from which it is deposited on cooling as a

white powder consisting of microscopic needles.

Sulphocarbonapthalide.

 $C^{42}H^{15}N^{2}S^{2} = C^{40}CyNH^{14},H^{2}S^{2}$.

Delbos. N. Ann. Chim. Phys. 21, 68; Compt. rend. 24, 1091; N. J.
 Pharm. 12, 237; Ann. Pharm. 64, 370; J. pr. Chem. 42, 244; Pharm.
 Centr. 1847, 637; Liebig & Kopp's Jahresb. 1847-8, 610.

Naphthalidam-sulphocarbamid. (Delbos.)

Formation. From naphthylamine and bisulphide of carbon (comp. p. 97, 12.) — 2. From naphthalin and naphthalosulphocyanic acid, (comp. p. 119, 1).

Preparation. Bisulphide of carbon is mixed with a solution of naphthylamine in absolute alcohol. After one or two days, the liquid deposits sulphocarbonaphthalide, on the sides of the vessel, as a white crystalline vegetation. The mixture blackens if allowed to stand for three or four days, owing to the formation of sulphide of naphthalidam. By using a very dilute solution of naphthylamine in absolute alcohol, sulphocarbonaphthalide is obtained in brilliant, colourless needles. (Delbos.

Properties. Snow-white crystalline mass, or small and very brillian prisms.

2	8		32	16600	9.76		9.09
		***************************************		****	8:54		9.69
				****	4.87	mmor.	4.59
42	C		252	-	76.83		78.86
							Delbos.

1. By boiling with alcoholic potash, it is converted Decompositions. into carbonaphthalide (comp. p. 123. Delbos). 2. By dry distillation it is decomposed, naphthylamine being liberated and the substance at the same time becoming charred. (Delbos.) Distilled with phosphoric anhydride it yields naphthalosulphocyanic acid, (p. 119. Hall.) — 4. It is not affected by dilute acids. (Delbos.)

Insoluble in water, alcohol, and bisulphide of carbon. (Delbos.)

Menaphthylamine.

C42H17N3 = C40CyNAdH13,H2.

W. H. Perkin. Chem. Soc. Qu. J. 9, 8; Chem. Gaz. 1856, 519; N. Phil. Mag. J. 12, 226; Instit. 1856, 300 and 406; Ann. Pharm. 98, 236; J. pr. Chem. 68, 152 and 441; Chem. Centr. 1856, 394; Liebig & Kopp's Jahresb. 1856, 538.

Menaphtalidin.

Formation. From naphthylamine and chloride of cyanogen (comp. p. 97). (Perkin.)

Preparation. By A. W. Hofmann's process for preparing melaniline, (xi, 351). A number of glass tubes are partly filled with naphthylamine maintained in fusion by a gentle heat, and gaseous chloride of cyanogen is drawn through them by means of an aspirator. As soon as the reaction commences, heat is developed; the liquid thickens, so that the passage of the gas is impeded; and at the end of the operation, the mass must be carefully warmed to keep it sufficiently fluid. The mass, which after cooling is black and resinous, and consists principally of hydrochlorate of menaphthylamine, is boiled with a large quantity of water, and the menaphthylamine is precipitated by ammonia or potash from the filtered solution, as a white precipitate, which is washed with water in order to free it from chloride of potassium or chloride of ammonium, and purified by one or two recrystallisations from alcohol.

Properties. Small, white needles, inodorous and having a bitter taste. It becomes coloured in the air; and restores the colour to reddened litmus.

				Perkin.	
42 C				80-89	
17 H		13.6		5.54	
CARCO 374 37712 770			-		

C40CyNAdH13,H2 311 100.0

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The limit make in a constitutive with acid, it may also a require the second constitution of the second constitution water and the material constitution of the second constitution of

So there of the prinkplants. Best this had by neutralising the base with at plants and — We to perfectly amorphous substance, only moderately such a magnetic and the solution it is reprecipitated as a wante powder.

Hydricelate and H. Soldenave of Menaphthylamine are crystalline and very soluble in alone land in other.

Hydrochlorate of M-naj Min. Zamine. White, amorphous compound turning slightly red in the air. Rather soluble in water, very soluble in alcohol and in other. Decomposed by heat, hydrochlorate of naphthylamine subliming, and a black residue remaining in the retort.

 Cetti/N3HC1	 	 	10-41	
HCl			10.44	
			Perkin.	

rute of Menaphthylamine is the most beautiful of all the salts of thylamine. It is prepared by dissolving the pure base in dilute

boiling nitric acid. It is deposited from this solution in small white prisms. Almost insoluble in cold water; dissolves abundantly in alcohol and in other.

Chloroplatinate of Menaphthylamine is best obtained by mixing an alcoholic solution of platinic chloride with warm alcoholic solution of hydrochlorate of menaphthylamine; small, yellow, brilliant scales are then deposited. If aqueous solutions are employed, the compound is immediately precipitated as an amorphous powder, which is almost white but soon assumes a green colour. Perkin found 19.07 p. c. Pt.; the formula C42H¹⁷N²,HCl + PtCl² requires 19.08 p. c.

Terchloride of Gold gives a blue precipitate with solution of menaphthylamine.

Menaphthylamine dissolves in alcohol and in ether.

Bicyanomenaphthylamine. C⁶⁶H¹⁷N⁵ = C⁶⁶Cy³Ad²H¹¹,H².

W. H. PERKIN. Chem. Soc. Qu. J. 9, 8; Ann. Pharm. 98, 236; J. pr. Chem. 68, 152 and 441; Liebig & Kopp's Jahresb. 1856, 538.

Dicymenaphthylamine. (Perkin.) Bicyanmenaphtalidin.

Formation. Produced from menaphthylamine and gaseous cyanogen (comp. 126, 2).

Preparation. Gaseous cyanogen is passed through ether containing menaphthylamine in suspension. The whole is dissolved, and after a time, bicyanomenaphthylamine is deposited as a crystalline, dark-yellow substance, and is purified by washing with ether.

Properties. Pale yellow; crystallises with difficulty.

46 C 17 H 5 N	17	 4.69	Perkin. at 100°. 76.00 4.71
C ⁴⁰ Cy ³ Ad ² H ¹³ ,H ²	363	 100.00	

Insoluble in water.

Bicyanomenaphthylamine is a base, although a very unstable one; it dissolves with ease in dilute acids and may be reprecipitated by ammonia, if added immediately after dissolving the base; but, like cyananiline and bicyanomelaniline, it cannot remain longer in acid solution, without undergoing complete decomposition. If the solution of bicyanomenaphthylamine in acids be left to itself only a few seconds, it becomes turbid and deposits yellow menaphthoximide. (Perkin.)

 $C^{46}H^{17}N^5 + 4HO + 2HCl = C^{40}(C^4HO^2)CyNAdH^{12},O^2 + 2NH^4Cl.$

Bicyanomenaphthylamine is moderately soluble in alcohol and in other.

Oxanaphthalide.

 $C^{\alpha}H^{2i}N^{2}O^{\alpha} = C^{\alpha}(C^{i}HO^{2}NAdH^{2i},O^{2})$

ZINN. Petersb. Acad. Bull. 16. 282; Ann. Pharm. 108, 228; J. pr. Chen. 74, 379; Rep. Chim. pure. 1, 148.

Formation. By the action of heat on exalate of naphthylamine (comp. 100, s and b).

Preparation. The residue which remains after fusing acid oxalate of naphthylamine, is treated with alcohol, whereby the formylnaphthalide (p. 117) is dissolved out, leaving insoluble oxanaphthalide.

Properties. Small scales. Melts at about 200°. Zinin found 77.78 p. c. C and 4.87 p. c. H; by calculation, 77.64 p. c. C and 4.70 p. c. H.

Decompositions. Heated for a long time above its melting-point, or submitted to dry distillation, it decomposes for the most part, yielding almost pure carbonic oxide, and forming carbonaphthalide CacCyNH, H²O².—2. It is but very slightly affected by dilute aqueous potast or even by rather concentrated acids (nitric acid excepted); but if it be boiled with alcoholic potash or heated with concentrated aqueous potast (1 pt. potash to 3 or 4 pts. water), it is resolved into naphthylamine and oxalic acid.

Insoluble in water, sparingly soluble in boiling alcohol.

Menaphthoximide.

 $C^{\omega}H^{12}N^{3}O^{4} = C^{\omega}(C^{4}HO^{2})C_{y}NAdH^{13},O^{2}(1).$

W. H. PEREIN. Chem. Soc. Qu. J. 9, 8; Ann. Pharm. 98, 236; J. pr. Chem. 68, 152 and 411; Liebig & Kopp's Jahresb. 1856, 538.

Pormation. (Comp. p. 127.)

Preparation. Warm, alcoholic solution of bicyanomenaphthylamine is mixed with hydrochloric acid and allowed to stand, whereupon menaphthoximide is deposited in small yellow spangles.

Properties. Small, yellow spangles.

					rerkui. ed at 10	0°.
46 C	276	••••	75.66		75-6	
15 H	15	••••	4-10	*****	4.2	
8 N	42	••••	11.20			
4 O	32	****	8.74			
CaHnV3O4 ""	365		100-00			_

Darkin

Decompositions. 1. When heated, it melts at 245° and is decomposed '80°, puffing out white vapours having a strong and most peculiar

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odour; the substance hereby formed is probably naphthalocyanic acid (p. 118.), analogous to anilocyanic acid.—2. With aqueous potash it forms menaphthylamine and oxalic acid; and hence may be regarded as acid oxalate of menaphthylamine minus 4 At. water. (Perkin.) -3. It is converted by acids, in a similar manner to melanoximide, into oxalic acid and menaphthylamine; a white neutral body being simultaneously formed.

Insoluble in water; very sparingly soluble in alcohol and in ether (it may be obtained crystallised from the latter, though with difficulty).

Ternaphthylphosphamide,

 $C^{60}N^{24}N^{3}PO^{2} = C^{60}N^{3}(PO^{2})H^{18}, H^{6}(?).$

H. Schiff. Ann. Pharm. 101, 299; J. pr. Chem. 70, 264; Chem. Gaz. 1857, 211; Chem. Centr. 1857, 166; Liebig & Kopp's Jahresb. 1857, 389.

Formation and Preparation. Naphthylamine heated with oxychloride of phosphorus on a water-bath, yields a reddish uncrystalline product, while the excess of liquid contains hydrochlorate of naphthyl-

This, as Schiff proved, is ternaphthylphosphamide, since from oxychloride of phosphorus and ammonia or aniline, terphosphamide, N³PO²H², or terphenylphosphamide, C³6H¹5N³PO², is produced. (Schiff.)

The dried substance is readily decomposed by hot water, or by boiling

alkalis or acids; melted with potash, it evolves naphthylamine, and vields phosphate of potash.

Primary nucleus, C20H10; Oxygen-nucleus, C20H6O4.

Alizarin.

$C^{20}H^6O^6 = C^{20}H^6O^4, O^2$.

Colin & Robiquet. Ann. Chim. Phys. 34, 225; J. Pharm. 12, 407; Berz. Jahresb. 7, 265; N. Tr. 14, 1, 174. Kuhlmann. J. Pharm. 14, 354; Berz. Jahresb. 8, 275.

ZENNECK. Pogg. 13, 261.

GAULTIER DE CLAUBRY & PERSOZ. Ann. Chim. Phys. 48, 69; N. Tr.

25, 2, 186. F. F. Runge. Verhandl. des Vereins zur Beförderung des Gewerbsleisses in Preussen, 1835, Heft 2; J. pr. Chem. 5, 374; abstr. Ann. Chim. Phys. 63, 282.

ROBIQUET. J. Pharm. 21, 387; J. pr. Chem. 6, 130;—against Runge:
Ann. Chim. Phys. 63, 297;—against Decaisne: Ann. Chim. Phys. 73, 274.

DECAISNE. J. Pharm. 24, 424; J. pr. Chem. 15, 393.

J. Schiel. Ann. Pharm. 60, 79.

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To that Are the second second in the form of the second (Coln & Toronto) Krapp-rold (Range, State) I form the second (Siii, 325).

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In the state of the state of the state of the substance from visit and the

F it Sentings them when heated a sublimate of all many that is the state of the state with erythrozym, it is now you at a little that products her Enting .— 2. Schunck's The volume of the state of the same circumstances as rubian, yet in a sum of the same in the same decomposition of all and the same manner as pure rulian is do only sed see Rubian. (Schunck.)—The xanthin and the greater varied the rubiacin disappear, giving rise to

xanthin and the greater part of the rubiacin disappear, giving rise to alizarin. (Higgin.) - Fresh colle-prepared extract of madder is reddish brown, has at first a sweet, then an unpleasantly bitter taste, and dyes cotton fabrics a pure yellow, like xanthin. After an hour or two, it becomes gelatinous, and, if sufficiently concentrated, deposits orange flakes of alizarin and rubiacin, more of which are precipitated by suphuric acid; and after filtration, a perfectly sweet and no longer bitter liquid remains, which dyes calico pale red, and (tested by the method given under xanthin) contains no more xanthin. (Higgin.)

If the alizarin is precipitated from fresh extract of madder by accesse of lime, and the filtrate divided into three parts, whereof a is immediately examined, & diluted with water and allowed to stand for four hours, and c ed to stand for three hours; hydrochloric acid precipitates from a pure

ALIZARIN. 131

rubiacin, while xanthin remains in the filtrate; b on the contrary is no longer bitter, yields with hydrochloric acid a precipitate of rubiacin, but contains no xanthin; c has become lighter, has deposited flakes of alizarin, and contains rubiacin in solution. — Hence xanthin is converted into rubiacin and this into alizarin. This change also takes place in vacuo, and accordingly without the influence of oxygen (as Decaisne supposed), being in fact due to a nitrogenised constituent of madder (see Erythrozym) of which good madder contains sufficient to decompose an addition of 20 p. c. of its weight of xanthin. The decomposition takes place most rapidly between 50° and 55°, at which temperature all the xanthin in madder over which water has been poured, is converted in half an hour into rubiacin, and in 4½ hours almost all the rubiacin is converted into alizarin. By prolonged standing, the alizarin becomes fixed on the madder-fibres, and cannot then be extracted by water till the whole has been treated with acid. — This change is retarded by boiling the madder. Decoction of madder retains its bitter taste and deep yellow colour after long standing. A cold-prepared infusion deposits on boiling, flakes of a nitrogenised substance, and the filtrate thus on the same substance, together with rubiacin, alizarin, and pectin, leaving a filtrate which contains xanthin, and does not decompose. The nitrogenised substance, together with pectin, is precipitated as a jelly from the cold infusion by alcohol, and the filtrate undergoes no further change; but if the liquid be heated with the precipitate till all the alcohol is driven off, it redissolves, and the clear solution suffers the usual decomposition. (Higgin.)

Preparation. A. From madder. 1. The operation is conducted as described at page 326, vol. xiii, and the alizarite of alumina thus obtained is decomposed by boiling dilute hydrochloric acid. The precipitated alizarin is dissolved in boiling alcohol, crystallised by slowly evaporating the solution, and purified by recrystallisation. (Debus.)—In the same way Schunck decomposes the alizarite of alumina obtained in the first method of preparing rubian (see below); whereupon, however, on cooling the alcoholic solution of alizarin and allowing it to stand, a brown pulverulent resin is generally deposited between the crystals, and must be removed by levigating with alcohol.—Wolff & Strecker boil the alizarite of alumina obtained by method 1 (xiii. 326,) repeatedly with concentrated aqueous carbonate of soda, as long as the liquid acquires a deep colour, whereby purpurin is extracted; an admixture of resin is then removed by repeated washing with warm ether, and the residue is decomposed as above.

2. Madder washed as described (xiii, 326, 3), is boiled with solution of alum for four days; whereupon the brownish red precipitate containing the alizarin which is deposited from the extracts, is repeatedly boiled with dilute hydrochloric acid, the residue washed and dissolved in alcohol. On evaporating down the alcoholic solution and allowing it to cool, it deposits crystals of alizarin, which is freed from the purpurin contained in it by dissolving in a small quantity of alcohol and repeatedly boiling with solution of alum, as long as the liquid becomes coloured; whereupon the alizarin is precipitated and the purpurin passes into solution. The alizarin is obtained in crystals by washing the product, dissolving the ether, and abandoning the solution to spontaneous evaporation. (Runge.) Schiel adopts a similar method, boiling with alcoholic solution of alum,

the precipitate, which is deposited on cooling from the madder-extract prepared with alum, whereupon the colouring matters form two strata on cooling. He removes the upper light red flocculent stratum; again treats the lower dark-brown stratum with alcoholic alum; boils; and thus continues the operation, till the upper flakes give a pure violet solution with potash, whereupon he separates the alizarin from the undissolved portion by boiling with hydrochloric acid, recrystallising from alcohol, and finally from ether.

3. Rochleder proceeds as described (xiii, 327), or precipitates the alizarin and purpurin from the aqueous decoction of madder by barytawater, filters off the violet precipitate, and decomposes it with moderately strong hydrochloric acid, whereby chloride of barium is dissolved out, leaving a residue of alizarin containing a little purpurin, which may be

separated by recrystallisation.

4. Commercial garancin is warmed two or three times with \ pt. ammonia-alum dissolved in water; the liquid evaporated with constant stirring; the residue dried, pulverised, treated with boiling bisulphide of carbon (or with absolute alcohol), and filtered from undissolved alum; and the brilliant golden-yellow solution is allowed to cool; whereupon alizarin crystallises out in silky needles. (L. Vilmorin, J. Chim. Med. 1859, 255; Dingl. pol. Journ. 152, 159; Chem. Centr. 1859, 380.)

5. When the extract prepared from madder with wood-spirit is tritarated with 10 pts. water, and heated in closed vessels for 15 minutes at 250°, the water after cooling is found full of crystals of alizarin, which may readily be separated from the fused extract at the bottom of the vessel; and by repeating the operation three times, the whole of the alizarin may be extracted. (Plessy & Schützenberger, Compt. read. 43, 167; J. Pr. Chem. 70, 314.)

Older methods. Alsatian madder is softened with 3 or 4 pts. of cold water for 10 minutes, and the mass is pressed between linen. The brownish red liquid coagulates in a trembling jelly, which is gradually pressed through several folds of thick linen, then moistened with water and again pressed out. The residue may be sublimed; or else it may be exhausted with alcohol; the tincture reduced to 1th of its volume; the residue mixed with a little sulphuric acid and a large quantity of water; and the resulting bulky, brownish yellow precipitate washed by decantation with a large quantity of water, as long as the wash-water exhibits an acid reaction. It is then dried, and the alizar is either acptrated by sublimation or extracted with ether. (Colin & Robiquet.) -Kuhlmann recommended to extract with boiling alcohol either the crude madder, or madder previously washed with cold water, then be evaporate the tincture, and when the residue has become almost thick but still contains alcohol, to precipitate it with sulphuric acid and water, and either to sublime the precipitate or extract it with ether. (J. Phus. 14, 363.) - Zenneck washes madder with cold water, then with dilute sulphuric acid; exhausts the dried residue with ether; and sublimes the residue left by evaporating the ether. An oil obstinately adheres to sublimed alizarin, and may be removed by rincing the crystals with ether and pressing them hard between blotting paper. (Robiquet.)

Gaultier and Persoz prepared their matière colorante rouge, which appears to be impure alizarin, by precipitating the alkaline decoction of madder obtained as described (xiii, 326, 2) with an acid, washing the

scipitate, dissolving it in alcohol, and evaporating.

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Useful for comparing different kinds of Madder. 10 kilogr. madder are boiled for 30 minutes with 2 kilogr. alum and 20 kilogr. water, then poured upon linen, and the residue is pressed and treated three times in the same manner. The united extracts are allowed to stand for a certain time, and after they are quite cold, decanted, and mixed, during constant stirring, with 625 grammes of sulphuric acid (previously diluted with twice its weight of water), whereupon thick reddish flakes are precipitated, which, after having been thoroughly washed, are dried in the air. Alizarin thus obtained still contains lime, xanthin, and purpurin. To remove these substances, it is dissolved in aqueous carbonate of potash and the filtrate is precipitated by sulphuric acid. Avignon-madder yields from 2 to 3 p. c. alizarin. (Meillet, Kev. scient. 1, 213.)

- B. From Rubian. 1. By boiling with acids. Aqueous rubian (or extract of madder prepared with boiling water) is boiled with a large quantity of dilute sulphuric acid as long as orange-coloured flakes continue to deposit; it is then allowed to cool, and the flakes are collected and washed (the filtrate from them sometimes yields an additional quantity when again boiled with fresh acid). They contain alizarin, rubiretin, verantin, and rubianin, and are submitted to the following treatment:
- a. In case only Alizarin is required. The substance is dissolved in alcohol, precipated with hydrate of alumina, and filtered; the precipitate is treated with aqueous carbonate of potash or soda, as long as anything is dissolved; the residue is collected and decomposed by an acid; and the precipated alizarin is crystallised from alcohol. (Schunck.)

In case Rubiretin, Verantin, and Rubianin are also required. — The substance is dissolved in boiling alcohol; the reddish yellow solution filtered boiling; and the residue boiled with fresh alcohol as long as the latter acquires a dark yellow colour. The yellow or brownish yellow crystalline mass left in the residue is chiefly rubianin, which, however, may also be dissolved by frequent treatment with boiling alcohol, whence it crystallises on cooling, as well as from the first extracts. The solutions are left to cool, and the crystals of rubianin containing verantin (see further treatment of this below) are separated from the mother-liquid (which, however, still contains a little rubianin). Acetate of alumina is now added to the liquid, whereby all the alizarin together with a small quantity of verantin is precipitated as a dark red powder, which is collected and washed with alcohol till the washings are colourless. The mother-liquid serves for the preparation of rubiretin, rubianin, and verantin. The precipitate is decomposed with hydrochloric acid; the flakes of alizarin and verantin thus separated are washed with water and dissolved in alcohol; and all the verantin is precipitated from the solution as a reddish brown copper-compound by acetate of copper, while the alizarite of copper remains dissolved in the dark purple filtrate, from which alizarin is prepared by precipitating with hydrochloric acid, thoroughly washing the precipitate, dissolving in alcohol, and recrystallising. (Schunck.)

The following method is adopted to purify the rubianin, rubiretin, and verantin, likewise obtained—

a. Rubianin. When an aqueous decoction of madder is employed instead of rubian, rubiacin is obtained in place of rubianin. — a. The crystals of rubianin containing verantin obtained as above are dissolved in

boiling alcohol; the verantin is precipitated by acetate of lead as verantite of lead; and the liquid is filtered and left to cool, whereupon large lemon-yellow needles of rubianin are deposited. — β . The mother-liquid remaining after the precipitation of the alizarite of alumina, and still containing rubiretin, rubianin, and verantin, is evaporated to dryness, and the residue is mixed with hydrochloric acid and washed with water till all traces of acid and alumina have been removed. The residue is boiled with water, whereupon brown drops of resin are precipitated, and brownish yellow flakes float on the water. These are poured off with the liquid from the resinous drops (rubiretin and verantin), and this transment is repeated as long as flakes are obtained. The flakes consist of rubianin and verantin, the first of which dissolves by repeated decoction with water, and is deposited in orange-coloured flakes on cooling. These are dissolved in boiling alcohol, and as the liquid cools, crystals of rubianin are obtained, while a small quantity of alizarin and rubiretin remains in the mother-liquid. (Schunck.)

b. Rubirctin. When the resinous drops obtained above are treated with cold alcohol, they yield rubirctin, verantin remaining undissolved (Schunck.)

c. Verantin. Obtained in the preceding processes partly as verantite of lead, partly as verantite of copper, and partly as insoluble residue (a and b). The first two are decomposed with dilute sulphuric acid, and the verantin is extracted with boiling alcohol, then dissolved in a small quantity of boiling alcohol, and the dark reddish or yellowish brown powder deposited on cooling is purified by redissolving in alcohol.

(Schunck.)

The madder-root exhausted with boiling water for the preparation of rubian, still contains alizarin, rubiacin, and verantin. It is boiled with hydrochloric acid, washed with water, and boiled with potash, whereby a dark red solution is formed, which being filtered and supersaturated with an acid, yields a dark, brownish red precipitate. This being boiled with water, yields alizarin and pectic acid, and leaves a residue of rubian and verantin. The alizarin is separated from the pectic acid by recrystalisation. The mixture of rubiacin and verantin boiled with ferric mixture, yields a solution of rubiacic acid, which may be precipitated by hydrochloric acid, while verantin remains undissolved. (Schunck.) See below, rubiacinic acid.

2. By boiling with alkalis. Rubian is boiled with an excess of caustic soda, till the colour of the liquid, which was at first blood-red, has turned purple-red, and the liquid having become more concentrated, deposits dark purple-red alizarite of soda. The solution is now decomposed with excess of dilute sulphuric acid, whereupon it becomes colourless, depositing orange-coloured flakes, which, having been thoroughly washed with water, form a mixture of alizarin, verantin, rubiretin, and rubiadin. The flakes are treated with boiling alcohol, which dissolves them leaving a dark-brown substance (formed from sugar); the liquid is filtered, and the filtrate is precipitated with acetate of alumina, whereby alizarite of alumina, together with a small quantity of verantin, is precipitated, and is further treated as above described. (Schunck.)—For the further treatment of the mother-liquid containing rubiadin, rubiretin, and verantin, see Rubiadia.

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3. By fermentation — Action of Erythrozym on Rubian — or by Fermentation of Madder. By this method alizarin, rubiretin, and verantin are obtained in smaller quantity than by methods 1 and 2, and are more difficult to purify. Erythrozym is added to aqueous rubian, and the liquid is allowed to stand in a moderately warm place until it has become tasteless and colourless, owing to the deposition of a brown jelly. If this deposit should not take place in 24 hours, more crythroxym must be added. Or madder is stirred up with cold or warm water, and left in a warm place till a jelly is formed. In both cases, the mass is mixed with a little water, and the jelly is collected on a filter and washed with a small quantity of water. It contains alizarin, rubiretin, verantin, rubiafin, rubiagin, and rubiadipin,

which are separated as follows :-

The mass is well boiled with alcohol as long as the liquid acquires a yellow colour, and acetate of alumina is added to the filtrate, whereby alizarin, verantin, and rubiafin are precipitated in combination with alumina, but only partially. The whole is then filtered (for the further treatment of the precipitate, see below), and sulphuric acid and a large quantity of water are added to the dark brownish-red filtrate, whereby the whole of the dissolved substances are precipitated as a yellow powder, which, having been thoroughly washed with water, is redissolved in boiling alcohol and mixed with excess of acetate of lead. The dark purple-red lead-precipitate, which is filtered boiling, contains alizarin, rubiretin, verantin, and rubiafin; the dark yellow filtrate rubiagin and rubiadipin. The lead-precipitate is decomposed with boiling hydrochloric acid, and the precipitated yellow flakes are washed and covered with cold alcohol, which extracts rubiretin, leaving alizarin, rubiafin, and verantin. On the other hand, the above-mentioned precipitate produced by acetate of alumina is decomposed with boiling hydrochloric acid; the orange flakes thereby separated are added to the residue of alizarin, rubiafin, and verantin, which was left undissolved by cold alcohol; and the whole is dissolved in boiling alcohol and mixed with acetate of copper, which forms a purple precipitate (rubiafite, verantite with a small quantity of alizarite of copper). After filtering off the precipitate, alizarin alone remains in solution and is precipitated by hydrochloric acid and water, and purified by crystallisation. (Schunck.)

Treatment of the Verantite and Rubiafite of copper. The purple copper precipitate, decomposed by hydrochloric acid, deposits insoluble red flakes, which, after washing, are dissolved in boiling alcohol, and treated with hydrated stannous oxide, whereupon only rubiafin remains dissolved, and crystallises from the filtrate in brilliant needles and laminæ, while

verantin, together with a small quantity of alizarin, is precipitated as a stannous oxide-lac. (Schunck.) See Verantin.

Higgin obtains his alizarin (rubiacin and xanthin), the first of which is probably a mixture of alizarin and purpurin (see Wolff & Strecker, Ann. Pharm. 75, 3), in the following manner : - Madder is exhausted in a digesting funnel with hot water, till the washings run off almost colourless; the cold extract is precipitated with dilute sulphuric acid; the precipitated flakes, containing alizarin, rubiacin, and a small quantity of pectin, are collected; and the filtrate, containing xanthin, traces of alizarin, and a small quantity of sugar, is kept for the preparation of xanthin. The flakes are first washed with water acidulated with sulphuric acid, then with pure water, afterwards mixed with an equal bulk of powdered chalk, and boiled with water, till the washings assume a

bright red colour. This aqueous solution contains rubiacin, which is separated by acidulating the filtrate with sulphuric acid, collecting and washing the greenish yellow precipitate, and recrystallising from alcohol. The residual chalk contains Higgin's alizarin, which is extracted by digesting with dilute hydrochloric acid, filtering, washing the residue, and recrystallising from alcohol.

Preparation of Higgin's Xanthin. The filtrate obtained as above is neutralised with carbonate of soda; the rubiacin and alizarin still in solution are precipitated by digesting the liquid for half an hour at 55° with a small quantity of hydrate of alumina; the phosphoric and sulphuric acids are separated from the filtrate by means of baryta-water; and the xanthin is precipitated from the filtrate as a red lae by subacctate of lead. This being washed with water, suspended in water, and decomposed by sulphuretted hydrogen, deposits xanthin together with sulphide of lead. The mixture is then washed with cold water and the xanthin extracted by boiling water; the solutions are evaporated to a syrup (neutralised with baryta, if necessary), and then, to complete dryness; the residue is extracted with absolute alcohol; and the alcoholic

solution is evaporated. (Higgin.)

The madder, after thorough washing with hot water, still contains the greater part of the alizarin (p. 135) together with only a small quantity of rubiacin. To separate the alizarin, the madder residue is boiled three or four times with a weak solution of alum, whereby the rubiacin is removed, and the residue is then boiled for a quarter of an hour with a saturated solution of alum and filtered, this treatment being repeated till the madder is exhausted and has become ash-grey. The united decoctions are cooled to 32° and strongly acidified with dilute sulphuric acid, whereupon the alizarin is precipitated, the precipitation being promoted by rapidly stirring the liquid. The product is collected and purified as above. Higgin's alizarin differs from that prepared by other chemists, by its property of dissolving with purple-red colour in boiling aqueous alum. Since this solution does not yield much deposit on cooling, it perhaps consists of purpurin (p. xiii, 325), or according to Schunck, of alizarin containing verantin (see below, Verantin). When boiled with aqueous sulphate of ammonia (or sulphate of potash) it is converted into a purplered powder, without dissolving (the behaviour of pure alizarin is not known), and may thus be separated from Higgin's rubiacin.

Properties. Hydrated alizarin (p. 138) parts with its water between 100° and 120°, becomes opaque, assumes a darker red colour, like native chromate of lead, and is converted into anhydrous alizarin (Schunck). which melts at a higher temperature, solidifies in a reddish brown which melts at a higher temperature, solidifies in a reddish brown crystalline mass on cooling, and sublimes, according to Schunck, at 215°, according to Schiel, at 225°, in long, brilliant, golden yellow needles, reflecting light with red colour. (Colin & Robiquet.) Sublimed alliants forms four-sided, flexible (Zenneck), brilliant, orange-coloured (Runge, Schiel), reddish yellow (Debus), red, transparent needles. (Robiquet.) It is brighter in colour than before sublimation, bright orange, transparent, and very brilliant. (Schunck.) In the first sublimation there always remains a residue of carbon, according to Colin & Robiquet. Runge & Shunck, Wolff & Strecker, but not on resublimation, according to Colin & Robiquet & Runge. Neutral (Colin & Robiquet). Reddens litmus. (Zenneck.) Heavier than water. Tastes bitter and neid. (Zenneck.)

Wolff	& Stre	eker	's c	alculation	n.	Sc	hunck'	s cal	cula	tion.	1	Robique	t.	Schist.
6 H	*******	6	****	3.45		5 H		5	****	4.13		70·09 3·73		67·46 4·22
6.0		48	****	27.59	*******	40		32	****	26.45	****	26.18	****	28.32
CWH6	06	174		100.00		CHH	5()4	191		100:00		100:00		100:00

	Debus.		Wolff &		Sc	hune	ck.
	Denus.	S	trecker.		earlier.		mean.
	mean.				dried.		sublimed.
C	68.97	****	68.4	*******	69.13		69.61
H	3.79	****		*******	4.01		3.73
0	27.24				26.86		26.66
	100.00				100.00		100.00

				hund				1	Rochleder.
	a.		ь.		c. mean.		d. mean.		at 100°.
C	69:37	****	69.07	****	69.59		69.38		67.93
Н	4.07	****	4.70	****	4.15		4.16		3.77
0	26.56	****	26.23	***	26.26	****	26.46	********	28.30
	100.00		100.00	****	100.00		100.00		100.00

a was obtained from rubian by sulphuric acid; b by soda; c by erythrozym; d from rubianic acid by sulphuric acid and soda. (Schunck.)

Earlier formulæ of alizarin: C³⁷H²⁴O¹⁰ (Robiquet); C²⁸H⁹O⁰ (Schiel); C³⁰H¹⁰O⁰ (Debus); C³⁰H¹⁹O¹⁰ = 3C²⁰H⁶O⁶ + Aq for the alizarin which Rochleder investigated. (Rochleder.) The formula C²⁰H⁶O⁶ given by Wolff & Strecker is most generally adopted; this does not exactly correspond with Schunck's analyses, and according to him does not explain the connection of alizarin with rubian and rubianic acid, and especially of the formation of alizarin observed by Schunck in decomposing rubianic acid (see Rubigaic formation of alizarin observed by Schunck in decomposing rubianic acid (see Rubianic Acid); Schunck's formulæ are therefore likewise given in the following pages.

Decompositions. 1. Alizarin heated on platinum-foil, melts and burns with flame. (Schunck.) When Schiel filled a glass bulb with alizarin, and passed a current of oxygen into it, an explosion took place as the substance was fused, and shattered the apparatus. 2. It is converted by boiling dilute nitric acid into oxalic acid and a peculiar acid (Schunck), into phthalic acid. (xiii, 10.) (Laurent & Gerhardt.)

$$C^{20}H^6O^6 + 2HO + 8O = C^{16}H^6O^8 + C^4H^2O^8$$
.

3. When alizarin is suspended in water and chlorine gas passed through the liquid, it turns yellow, gives by heat a colourless sublimate, and dissolves in alkalis without much colour. (Schunck.) - It remains apparently unchanged by the action of chlorine, but if mixed with potash after the excess of chlorine has been removed, it gives a deep red solution like purpurin and a purple-red precipitate with baryta; hence it has probably been converted into purpurin;

Aqueous alizarin is rapidly turned pale brown by chlorine. (Zenneck.) 4. It is converted into phthalic acid by ferric nitrate or chloride at the boiling heat. 4. It is (Schunck.) (For the behaviour of the alkaline solution with ferrous sulphate, see xiii, 329.) 6. It is decomposed by boiling with chromate of potash and sulphuric acid. (Debus, Schunck.) - 6. It reduces terchloride of gold on

addition of caustic potash. (Schunck.) - 7. According to Wolff & Strecker, alizarin is converted into purpurin by the fermentation of madder, inasmuch as these chemists were able to obtain only purpurin, but no alizarin, from fermented madder. This is denied by Schunck.

Combinations. With water. - a. Hydrated Alizarin. from alcohol: long, transparent, dark-yellow prisms of high lustre, resembling isatin, without any shade of brownish yellow or red, which they have only when contaminated with verantin. (Wolff & Strecker.) Large, rose-coloured needles. (Debus.) Brownish yellow, crystalline powder (Runge); brownish red mass, having a brilliant fracture. (Gaultier & Persoz.) It parts with 18:12 p. c. water at 100°, (C²⁰H⁶O⁶ + 4Aq = 17:14; C¹⁴H⁹O⁴ + 3Aq = 18:24 p. c.), without changing its form, and is converted into anhydrous aligarin. (Schunk.) is converted into anhydrous alizarin. (Schunk.)

	Wolff & St	recke	r's	calculati	on.	5	chunck's c	alcul	atio	n.	3	Schunck.
10 H	***************************************	10		4.76		8 H		8	****	5.40	****	5.06
C20H6	O6.4A0	210	65	100.00	500 CO	C14H5	O4.3Ao	148	-	100:00	25	100:00

b. Aqueous Alizarin. Alizarin is with difficulty moistened by cold water (Wolff & Strecker), and dissolves in it very slightly, but more readily in boiling water. (Colin & Robiquet.) It dissolves sparingly with yellow colour in boiling water, and is deposited in flakes on cooling. (Schunck.) The solution is rose-coloured (Colin & Robiquet), only when the water contains alkali. (Schunck, Wolff & Strecker.) The solution prepared with boiling water does not yield any deposit of Cooling (Couling & Possos) it is prepared by soil and deposit of the solution of (Gaultier & Persoz); it is precipitated by acids. (Kuhlmann.) The solubility of alizarin in water rapidly increases when the mixture is heated in a sealed tube above 200°. 100 pts. water dissolve at 200°, 0.82, at 225°, 1.70 and at 250°, 3.16 parts. (Plessy & Schützenberger. Compt. rend. 43, 167; J. pr. chem. 60, 314.)

It is not affected by weak acids (Gaultier & Persoz), by hydrochloric acids of the control of the c

acid. (Schunck.) Boiled with dilute acids, it dissolves with yellow colour, and is deposited in orange-yellow flakes on cooling. (Runge.)

Dissolves in sulphuric acid without evolution of sulphurous acid,

forming a blood-red solution from which it is precipitated by water unchanged. (Colin & Robiquet and others.) The colour of the solution in sulphuric acid is dark yellowish brown, and is not changed by heat. (Schunck.)

Dissolves in bisulphide of carbon, with reddish yellow colour. (Zenneck.) Alizarin combines with salifiable bases. These compounds, which are regarded by Debus as salts, lizarates, are red, violet (or blue). and are insoluble in water and in alcohol with the exception of the ammonia, soda, and potash-salts. metallic oxide to 1 At. alizarin. They seldom, if ever, contain 1 At.

When dry gaseous ammonia is passed over alizarin, the mass becomes warm and turns violet, but parts by heat with all the ammonia it has taken up and reassumes its yellow colour. Heated in a stream of ammonia, alizarin sublimes unchanged, but acquires a violet colour. (Rochleder.)

Dissolves in aqueous ammonia with orseille-colour, without any blue

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lustre on the surface. (Wolff & Strecker.) The ammonia-solution is purple-red (Runge), violet-red (Colin & Robiquet), red (Schiel); it becomes turbid as the ammonia evaporates (Gaultier & Persoz); leaves

a violet-brown film. (Schunck.) Dissolves in sulphide of ammonium with beautiful reddish brown colour. (Gaultier & Persoz.)

Dissolves readily in aqueous caustic alkalis; at a certain concentration, the solution appears of a deep purple colour by transmitted light, and pure blue by reflected light; when more diluted, it appears uniformly violet. (Wolff & Strecker.) The solution is pure blue (Colin & Robinster); of a beautiful red, permanent in the air (Gaultier & Persoz); of a magnificent violet-blue, and, when saturated, purple violet (Schiel); purple, and leaves on evaporation a purple uncrystalline mass. (Schunck.)

Dissolves in aqueous alkaline carbonates as in ammonia (Wolff & Strecker), with magnificent purple colour. (Schunck.) The solution is orange-red (Gaultier & Persoz); red. (Schiel.) Dissolves in arsenite, arseniate, and silicate of potash. (Gaultier & Persoz.) — It does not dissolve in cold bicarbonate of soda, till the solution is warmed, whereupon carbonic acid is evolved. (Zenneck.)

Alizarin is precipitated by acids from its alkaline solutions in deep

orange-coloured flakes. (Schunck.)

Alizarite of Soda. Alizarin is dissolved by heat in a cold-saturated solution of carbonate of soda, and the compound which is deposited on cooling is dried, then dissolved in absolute alcohol and precipitated by ether. Purple flakes, insoluble in concentrated solution of carbonate of soda and in cold concentrated saline solutions, but soluble in water and in alcohol with orseille colour, which is turned blue by caustic soda. (Wolff & Strecker.)

Alizarite of Baryta. Baryta produces a beautiful blue precipitate in the solution of alizarin in ammonia (Robiquet & Colin); it precipitates and decolorises the potash solution. (Schunck.) Alcoholic alizarin boiled with baryta, turns lilac, and deposits a lilac precipitate. (Zenneck.)

a. Bibasic. Alcoholic alizarin is precipitated with excess of baryta-

water; the precipitate is washed out of contact of air with water and warm alcohol, till the washings are no longer coloured by addition of potash; and the residue is dried at 100°. (Wolff & Strecker.)

Wolff & Strecker.

C20H6O6 + 2BaO, HO.	345	-	100:00	-	
2 BaO 2 HO		****	44·35 5·22	********	44.0
C20H6O6					

b. Sesquibasic. 1. Ammoniacal solution of alizarin yields with chloride of barium a magnificent purple (Schunck), almost pure blue precipitate, above which a colourless liquid remains. (Wolff & Strecker.) When dry, it forms a dark-brown, almost black mass, which acquires a yellow metallic lustre by trituration in an agate mortar. (Schunck.)
2. It was once obtained by precipitating alcoholic alizarin with baryta-water as in the preparation of the bibasic salt, and contained, at 100°, 38'3, and at 120°, 39'8 p. c. baryta. (Wolff & Strecker.)

a	t 100°.				Schunck.	Wolff & Strecker.
2 C20H6O6,3HO	375	****	62.04			
3 BaO	229.5	****	37.96	******	38.03	38.3

2C²⁰H⁶O⁶, +3BaO,HO 604·5 100·00

At 120° = 2C⁵⁰H⁶O⁶,3BaO (by calculation, 39.7 p. c. BaO). (Wolf & Strecker.) According to Schunck, the formula is C¹⁴H⁵O⁴,BaO or C¹⁴H⁴BaO⁴,HO, which requires 38.78 p. c. BaO.

38.78 p. c. BaO.

c. Sesqui-acid. Alizarin is dissolved in aqueous ammonia, and after the excess of ammonia has been evaporated off, the solution is precipitated with chloride of barium. After drying at 100°, the salt still loses weight at 120°. (Wolff & Strecker.)

a	1 120	0		Wol	ff & Strecker
60 C	360		53.3	*******	53.35
18 H	18		2.7	******	2.85
18 0	144		21.3	********	20.90
2 BaO	153	****	22.7	*******	22.90
3C20H6O6,2BaO	675		100.0	*******	100.00

Strontia-water produces a beautiful blue precipitate with ammoniacal alizarin. (Colin & Robiquet.)

Alizarite of Lime. Lime-water decolorizes alizarite of potash and precipitates alizarite of lime (Schunck); it behaves with ammoniacal alizarin like baryta-water. (Colin & Robiquet.) Alcoholic alizarin boiled with hydrate of lime acquires a lilac colour and deposits a lilac precipitate. (Zenneck.) Carbonate (and phosphate) of lime take up the colouring matter from aqueous (but not from alcoholic) alizarin; it is to this affinity between alizarin and phosphate of lime that the red colour of the bones of animals feeding on madder is owing. (Berzelius, A. Gehlen, 4, 124.) Alizarin dissolves in calcareous waters and forms a blue lac. (Runge.)

To prepare alizarite of lime an ammoniacal solution of alizarin is precipitated with chloride of calcium. Magnificent purple precipitate, like the baryta compound. (Schunck.)

at	100°.		5	mean.
2 C ²⁰ H ⁶ O ⁶ ,3HO				18.44
2C20H6O6+3CaO,HO	459	 100.0		

The formula is thus given by Wolff & Strecker; Schunck writes it C¹⁴CaH*,O⁸, HO, which requires 10.03 p. c. CaO.

Ammoniacal alizarin produces a violet precipitate with chloride of magnesium (Zenneck), a purple precipitate. (Schunck.) Alcoholic alizaria boiled with magnesia, behaves as with lime or baryta. (Zenneck.)

Alizarite of Alumina. Alizarin is scarcely soluble in alum-solution (Colin & Robiquet), insoluble. (Gaultier & Persoz and others.) When concentrated solution of alum is boiled with alizarin, it turns yellow, and on cooling becomes almost colourless, depositing what it had dissolved (Wolff & Strecker); it acquires a red iridescence, and on cooling deposits

small crystals of alizarin, none of which remains in solution. (Schunck.) The solutions of alizarin in alcohol and in potash are decolorised by hydrate of alumina, while the whole of the alizarin is precipitated, imparting a red or reddish purple colour to the alumina. (Schunck.) Alizarin dissolves in aluminate of potash. (Gaultier & Persoz.) It forms the base of madder-lake.

Alcoholic or ethereal solution of alizarin is precipitated by oxide of zinc. (Debus.) Alizarin dissolves readily in stannous chloride, and in large quantity in stannous oxide mixed with potash (Gaultier & Persoz); it is thereby reduced. (Schunck.) Ammoniacal alizarin forms a brown precipitate with tin-salts. (Zenneck.)

Alizarite of Lead. Ammoniacal alizarin produces a purple-red precipitate with acetate of lead.—a. Two-thirds? Alcoholic alizarin is precipitated with alcoholic acetate of lead. Purple precipitate, becoming deep red on standing. (Schunck.) b. Three-fourths? Alcoholic alizarin feebly acidulated with acetic acid is precipitated with alcoholic acetate of lead, so that the first remains in excess; whereupon a violet precipitate is formed, stable at 160°, insoluble in water, soluble in acetic acid and in potash. (Debus.)

According to W	According	Schunck.				
40 C	10 80	12.1	4 H	4 24	1·78 10·75	1.64
2C20H5O5.3PbO	666	100.0	C14H4O3.PbO	224	100-00	100.00

Prepared with alizarin obtained by decomposing rubian, it gave 50 44 p. c. PbO. (Schunk.)

According to Wolff	& St	reck	er.	at	Debus. 120° (mean).
60 C	360	****	38.2	******	38.35
15 H	15	****	1.6	*******	1.97
15 O	120		12.8		12.06
4 PbO	448	-	47.4	*******	47.62
3C20H5O5,4PbO	943	****	100.0		100.00

According to Debus, it is C30H8O7,2PbO.

Ammoniacal alizarin produces purple precipitates with ferrous and ferric-salts (Schunck); brown precipitates. (Zenneck.) Alcoholic and potash solutions of alizarin are precipitated dark purple by ferric oxide. (Schunck.) Ammoniacal alizarin produces a purple precipitate with salts of copper (Schunck), a brown precipitate (Zenneck); and likewise with salts of mercury and gold. Silver-salts are precipitated bright violet (Zenneck), purple, and then reduced. (Schunck.)

Alizarin dissolves in cold and more abundantly in boiling alcohol, with yellow colour. (Schunck, Wolff, & Strecker.) The solution turns red on the addition of a small quantity of ammonia. (Wolff & Strecker.) It dissolves in alcohol in almost every proportion (Colin & Robiquet), at 12° in 210 pts. of alcohol of sp. gr. 0.84. (Zenneck.) The hot-prepared

solution does not deposit crystals on cooling, but on dilution. (Schunck.) It is precipitated by water and by acids. (Kuhlmann, Schunck.)

Alizarin dissolves more readily in ether than in alcohol, with golden yellow colour (Colin & Robiquet, and others); at 12°, in 160 pts. ether of sp. gr. 0.73. (Zenneck.) The solution is not reddened by small quantities of alkalis, since the compound of alizarin with the alkali is precipitated. (Wolff & Strecker.)

Alizarin dissolves sparingly in boiling acetic acid, and imparts to it a yellow colour. (Schunck.) Dissolves slowly in cold, rapidly and more abundantly in hot glycerin, forming an intensely scarlet liquid, which deposits red flakes when mixed with water. (Arnodon, Dingl. pol.

Journ. 147, 465.) Alizarin dissolves in rock-oil, oil of turpentine, and in fatty oils. (Zenneck.) It produces on mordanted fabrics all the colours which can

be produced by madder. (Colin, Robiquet, and others.)

Primary nucleus C20H12.

Paranicene. C20H13.

ST. EVRE. N. Ann. Chim. Phys. 25, 503; J. pr. Chem. 46, 465.

According to Gerhardt (N. Ann. Chim. Phys. 45, 101), Pisani & E. Kopp (Compt. Chim. 1847, 198) obtained only chlorobenzoic acid by the action of chlorius upon benzoic acid dissolved in potash, and not St. Evre's chloroniceic acid. If this opinion be correct, and St. Evre had described as chloroniceic acid a mixture of benzoic and chlorobenzoic acids, chloronicene may be identical with chlorobenzene or chloride of phenyl (xi, 173), and chloronicene with chloraniline. Nitrochloronicene would be the unknown nitrochlorobenzene. It remains therefore to shew whether the formula of paranicene, nitroparanicene, and paracinin are to be changed in a corresponding manner, and to indicate the origin of these bodies. (Kr.)

Passes over when chloroniceate of baryta or a mixture of chloroniceic

acid with excess of baryta or lime, is submitted to dry distillation, after the chloronicene (C20Cl2H10), and contaminated thereby, as a white sublimate, which must be pressed between paper, carefully washed with cold ether, and passed in the state of vapour through a tube containing lime

heated to redness.

Lemon-yellow, broad lamina, of sp. gr. 1.24, and boiling at 265. It has a penetrating taste and smell. Vapour-density = 4.79.

20 C 120 12 H 12	90.90	St. Evre. mean. 90.77 9.04
C ²⁰ H ¹⁰ 132	100.00	99-81
C-vapour	Vols. V	apour-density. 8.3200 0.8316
Paranicene-vapour	2	9·1516 4·5758

It is violently attacked by fuming nitric acid and finally dissolves, depositing needles of paranicene on cooling. A small quantity of resin is formed at the same time.

Dissolves in alcohol and in ether.

Cuminic Alcohol.

 $C^{20}H^{14}O^2 = C^{20}H^{12}, H^2O^2$.

KRAUT. Dissertation über Derivate des Cuminols und Cymens, Gött. 1854; abstr. Ann. Pharm. 92, 66; J. pr. Chem. 64, 159; Pharm. Centr. 1855, 107; N. Ann. Chim. Phys. 43, 347.

Cymylic alcohol.

Formation. Produced by the action of alcoholic potash on cuminol at mean temperature, or more rapidly at the boiling heat.

Preparation. 1 vol. of cuminol is distilled upwards with 2 vols. of alcoholic potash for an hour; a large quantity of water is then added, and the whole is distilled, as long as oil-drops float on the distillate. A mixture of cuminic alcohol and cymene then passes over together with alcohol and water. This is collected, shaken up with very dilute solution of alkaline bisulphite in order to remove any undecomposed cuminol that may be present, then washed with water, dried over chloride of calcium, and distilled alone. The cymene which first passes over is collected apart, and thus separated from the cuminic alcohol which distils between 240° and 250°. The product is purified by several fractional distillations, the first portion of the distillate being rejected.

Properties. Colourless oil, having a feeble and pleasant aromatic odour and a burning taste. Boils at 243°. Taking into account the correction necessary for the temperature of the column of mercury, it must boil at a higher temperature, probably at 270°. (H. Kopp. Ann. Pharm. 96, 23.)

Permanent in the air. Neutral.

					Kraut.
20 C		****	80.00		79.58
14 H 2 O	14 16	****	9.33		9.36
C20H14O2	150		100.00	*******	100.00

Decompositions. 1. Cuminic alcohol is converted by nitric acid into cuminic acid. — 2. When cuminic alcohol is mixed with strong sulphuric acid, heat is developed and a brown resin is formed, which is brittle at ordinary temperatures but becomes semi-fluid in boiling water; no conjugated sulphuric acid is produced. — 3. It dissolves potassium with evolution of hydrogen, and on the application of heat is converted into a yellow granular mass, which is decomposed by water into hydrate of potash and cuminic alcohol. - 4. Boiled continuously for 10 or 12 hours with 5 or 6 vols. of alcoholic potash, it is almost completely converted into cymene and cuminate of potash:

$$3 (C^{20}H^{14}O^{2}) + KO,HO = C^{20}H^{11}KO^{4} + 2 C^{20}H^{14} + 4 HO.$$

5. Heated with chloride of benzoyl to 80°, it evolves a large quantity

of hydromatra and and leaves a brown residue becoming buttery on

ending producty because of employments in some in water. It does not not be with the administration in the line with the administration in the line with the administration of the second section in ಒ. ಕ್ಷಣಕ್ಕೆ ಮು.ಮ

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Generalet & Camites — 141 — 17 Ann. 1779. 1. 63; J. pr. Chem. 25, 111; Ann. Philip. 18, 17; N. En. Arch. 27, 155.
Camptes — 17. Ann. Chim. Phys. 28, 141; J. pr. Chem. 45, 143; abstr. 1 mm. Piston 73. 44.

Berthenne And Flora St. 75. Chrizza N. Ann. Chin. Flya. 34. 225 Kratz. Dimer. Merican ad reflyaen. Glai. 1854; abstr. Ann. Phora 32. 35; J. p. Chin. 34. 189; N. Ann. Chin. Phys. 43, 347.

Stevenson. L. sert. vier Camball. of Cymra. Gitt. 1857; abstr. Ann. Pierra. 106, 207; C. ce. Civ. a. 74, 307 L. Taler. Perril. Arch. Bull. 18, 208; C. ge. Ciem. 74, 428; Ann. Pierra. 108, 386.

Consert & Hilly In. Hard of the of the opt.

Solves. Obsers together with evidence in Roman oil of cumin, the vibile all of Compound type one. Gerhands & Cahours.) It exists ready formed in the seeds and may be extracted by absolute alcohol, and precipitated with water after evaporation. (Gerhands & Cahoura) Roman cumin seeds distilled four times with water, yield 3:27 p. c. oil. Note in Property 32, 185 of 185 of 2 Zellin, N. Jahrb. Pharm. 1854, 1, 225 of The chief highly pline-vellow, of sp. gr. 0:275, very mobile, and has a sharp, architical unit observed there tasts. (Bloy, N. Tr. 19, 1, 3) Roman cumin oil is coloured that we will be a small quantity of resin formed by the action of the air on comminds hence its colour cradually decreas. It becomes action exposure to the air. It begins gradually deepens. It becomes acid on exposure to the air. It begins to boil at 170°, and the portion passing over at 175° contains 88.27 p. c. C. 10.83 p. c. H. and 0.88 p. c. On the portions which come over afterwards up to 230°, are progressively right; in exygen, till at 255° an oil passes over containing 87.88 p. c. C. 10.44° p. c. H. and 3.66 p. c. O. Gerhardt & Cahours.) Roman cumin cill is resinised by faming nitric acid, and when treated with sulphurle acid, becomes viscid dark brownish red, and then milky on a little of water, owing to the deposition of resin. It turns greenish will w with bromine, without undergoing further change, and dissolves is line with brownish red colour, without evolving heat or detenating. It forms a liniment with caustic potash, also with amnumia. It dissolves a undantly (1) in water, and readily in alcohol and in other. (Bley)

Cuminol occurs also in the volatile oil of the seeds of the waterhemlick (Cionta virisen) (J. Trapp.) Ten pounds of the seeds of this plant gave by distillation with water 2 ez ef a colourless, limple oil. lighter than water, and possessing the clear and taste of Roman comin eds. When this oil is shaken with concentrated aqueous bisulphic of

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soda, it becomes milky and solidifies in 12 hours in a white crystalline mass of bisulphite of soda and cuminol to which cymene still adheres. The cymene is removed by pressing the product between blotting paper (whereby the oil is absorbed, and may be afterwards separated by distillation), and the mass is completely purified by recrystallisation from weak alcohol. (T. Trapp.)

Preparation. From Roman Cumin oil. 1. The oil is distilled in an oil-bath till the temperature has reached 200°, when all the cymene passes over together with a large quantity of cuminol; after prolonged heating, the residue consists of pure cuminol. This is distilled in a stream of carbonic acid, and preserved out of contact with the air. (Gerhardt & Cahours.) — 2. By submitting Roman cumin oil to repeated fractional distillation, it is divided into two parts, one boiling below 190° and containing almost all the cymene; the other boiling above 190°, and containing cuminol together with small quantities of cymene and cuminic acid. When 1 vol. of the latter is shaken up with 2 or 3 vols. concentrated aqueous bisulphite of soda, it forms a granular crystalline mass, which, after standing for 24 hours, during which time it becomes quite hard, is collected and pressed between blotting paper frequently renewed, and distilled with water and an alkaline carbonate or caustic alkali; pure cuminol then passes over with the vapour of water.

The cymene which has passed over below 1905 contains a little more cuminol, which may be separated by shaking the liquid with dilute bisalphite of soda, removing the precipitate, and distilling the solution with aqueous carbonate of potash. (Bertagnini, Kraut.) — If the compound of cuminol with bisulphite of soda be decomposed with dilute sulphuric acid and submitted to distillation, an oil no longer capable of combining with bisulphite of soda, remains in the residue; it is therefore better to rectify alone the cuminol separated by sulphuric acid from the compound with bisulphite of soda. (Sieveking.)

Properties. Colourless or yellowish oil. Boils at 220°, without decomposition, if air be excluded (Gerhardt & Cahours); from platinum, at 229.4°, or, taking into account the correction necessary for the mercury column of the thermometer, at 236.6°, under 748 mm. pressure. Sp. gr. = 0.9727, at 13.4°, = 0.9832 at 0°. (H. Kopp, Ann. Pharm. 94, 317.) Vapour-density = 5.24, but at the high temperature required for the determination the cuminol decomposes slightly. (Gerhardt & Cahours.) It has a strong smell of cumin, and a sharp, burning taste. (Gerhardt & Cahours.)

Dried over chlo	ride (of ca	lcium,	Gerha	rdt & Cahours.
20 C 12 H 2 O	120 12		81·08 8·11	•••••	80·89 8·45
C ²⁰ H ¹² O ²	148		100.00		100.00

8.3200
0.8316
1.1093
10.2609
5.13045

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Decompositions. 1. Oxidises at mean temperature in the air, especially in moist air. It becomes resinised and acid by distillation in vessels containing air. (Gerhardt & Cahours.) — 2. It is very alowly decomposed by water at mean temperature, without evolution of hydrogen, into cuminic acid and an oil richer in hydrogen (probably cuminic alcohol, Kr.). (Gerhardt & Cahours.) - 3. If fuming natric acid be gradually dropped upon cuminol, avoiding all elevation of temperature, till the brown colour of the mixture just disappears, the liquid on standing deposits white crystals of cuminic acid. If heat be applied, a large quantity of resin and nitrocuminic acid are obtained, even if dilute nitric acid be employed. (Gerhardt & Cahours.) - 4. Sulphuric and dissolves cuminol, if the liquid be kept cool, with dark red colour; on adding water, a brown tar is precipitated. (Gerhardt & Cahoura)-5. It is converted by moist bromine or chlorine, in diffuse daylight, into bromo- or chloro-cuminol. In the sun, chlorine is taken up more freely, probably because several atoms of hydrogen are replaced by chlorise. (Gerhardt & Cahours.) — 6. Cuminol, evaporated with hydrochloric acid, leaves a mixture of resin and cuminic acid. (Gerhardt & Cahours.)-7. By pentachloride of phosphorus it is converted into chlorocuminol. (Caliours.) - 8. Dry gaseous ammonia converts it, after a while, into a product analogous to hydrobenzamide. (Gerhardt & Cahours.) Sieveking was unable to obtain this product. Even on prolonged contact with aqueous ammonia, it does not form crystals, but only a yellow mass, which cannot be obtained in crystals, even after solution in ether and evaporation. (Sieveking.) Sieveking once obtained crystals by passing ammonia into alcoholic cuminol, but the quantity was too small for analysis. — 9. Its alcoholic solution is converted by sulphide of ammonium into thiocumol, C²⁰H¹²S². (Cahours, Compt. rend. 25, 459.) — 10. Potasium acts but slightly in the cold on cuminol, becoming dull but not evolving any gas-bubbles. On gently warming the tube, a violent action ensues, hydrogen is evolved in large quantity, and cuminol-potassium (Gerhardt & Cahours.) — 11. When cuminol is dropped on frised hydrate of potash, each drop as it comes in contact with the potash, turns first red, then white, and solidifies, forming cuminate of potash-(Gerhardt & Cahours.)

$$C^{2}H^{1}O^{2} + KO_{0}HO = C^{2}H^{1}(KO) + 2H_{0}$$

When a piece of hydrate of potash is covered with cuminol and a gentle heat applied, it becomes covered with a gelatinous cauliflower-like mass (without evolution of hydrogen), which, on being separated from the potassium and pressed between paper, deposits, in contact with water cuminol (cuminic alcohol, according to Kraut), while cuminate of potash remains in solution. (Gerhardt & Cahours.) It is decomposed by aqueous potash (Gerhardt & Cahours), and more rapidly by alcoholic potash (Kraut), without evolution of hydrogen, into cuminate of potash and an oil (Gerhardt & Cahours); into cuminic alcohol. (Kraut.)

$$2 C^{9}H^{12}O^{2} + KO_{0}HO = C^{3}H^{14}O^{2} + C^{9}H^{11}KO^{4}$$

Decomposition with evolution of hydrogen also takes place when cumind is acted upon by fused potash not too strongly heated. (Gerhardt & Cahours) — In this reaction, cymene is liberated, the cuminol being first decomposed into cuminate of potash and cuminic alcohol, and the latter further decomposed into cuminate of potash and cymene. (Kraut.)—12. By a mixture of bickromate of potash and sulphuric acid, it is converted into cuminic acid (Gerhardt & Cahours); if the action be prolonged.

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insolinic acid is formed (xiii, 318). (Hofmann, Ann. Pharm. 97, 207.) By heating Roman cumin oil with chromate of potash and sulphuric acid, Persoz obtained cyminic and cumino-cyminic acids, the first being identical with cuminic acid, the second with insolinic acid. (Compt. rend. 13, 431.)—13. By the action of cyanide of potassium on cuminol, Gerhardt & Cahours once obtained a product analogous to benzoin, which, however they were unable to produce again.—14. Heated with chloride of cumyl, it forms cumyl. (Chiozza.)

Combinations. With Potassium. Cuminol-potassium. When cuminol is carefully heated with a slight excess of potassium, a violent reaction, accompanied by abundant evolution of hydrogen, takes place, and the whole of the cuminol is converted into gelatinous cuminol-potassium. (Gerhardt & Cahours.) Chiozza heats cuminol with potassium in a covered platinum crucible, presses the product between blotting paper, and places it in vacuo over sulphuric acid, which absorbs with avidity the adhering cuminol.—According to Gerhardt & Cahours, it is also produced by the action of fragments of caustic potash on cuminol at ordinary temperatures (p. 146).

It is decomposed by water into cuminol and hydrate of potash, and rapidly converted by moist air into cuminate of potash. (Gerhardt & Cahours.) With chloride of cumyl, it forms chloride of potassium and cumyl; with chloride of benzoyl a similar product, which is rapidly

converted by aqueous potash into cumyl. (Chiozza.)

With Bisulphite of Ammonia. When Roman cumin oil (mixture of cymene and cuminol) is mixed and shaken up with aqueous bisulphite of animonia of 29° B., it forms almost immediately a crystalline mass, which, when separated from the mother-liquid and dissolved in boiling alcohol, deposits after a time beautiful groups of needles. (Bertaguini.) If the compound is kept in a sealed glass tube in the dark, it remains unchanged for several months, and then turns yellowish, probably from spontaneous decomposition. (Bertaguini.)

With Bisulphite of Potash. When Roman cumin oil is gently warme with aqueous bisulphite of potash of between 28° and 30° B., a large part of it dissolves, and is deposited on cooling in brilliant lamina of the compound of bisulphite of potash and cuminol. The undissolved portion yields all its cuminol when shaken up with fresh quantities of bisulphite of potash, so that only cymene remains. (Bertagnini.)

The compound is decomposed by water. Heated in a test tube, it evolves sulphurous acid and cuminol. It dissolves in water containing a small quantity of a bisulphite, without decomposition, even when heat is applied. It is insoluble in concentrated solutions of the alkaline bisul-

phites. (Bertagnini.)

With Bisulphite of Soda. Roman cumin oil, shaken up with aqueous bisulphite of soda of 27° B., forms a buttery mass, becoming hard in the course of a few hours. This is separated from the mother-liquid, and dissolved in very dilute boiling alcohol; whereupon it crystallises from the solution on cooling, in needles which may be purified by recrystallisation from dilute alcohol. (Bertagnini.)

Brilliant, white, inodorous needles (bulky, nacreous scales: Trapp), which turn yellow on prolonged exposure to the air (Bertagnini); they effloresce in the air. (Trapp.) When heated, it evolves sulphurous acid

and cuminol, and leaves sulphite of soda and charcoal (Bertagnini.) It is decomposed by boiling water, depositing a white powder, and forming a turbid milky liquid. (Trapp.)

It is decomposed by (aqueous?) ammonia; after prolonged contact, a thick oil is precipitated, probably resembling the oil produced from cuminol by ammonia. (Sieveking.) Insoluble in cold water. (Trapp.) Dissolves in water containing a small quantity of a sulphite, especially with the aid of heat. The solution is decomposed by heating with bases or acids. It is decomposed by iodine or bromine, with formation of sulphuric acid and separation of cuminol; an excess of bromine forms a crystalline, easily fusible substance, which combines with bisulphites and is probably bromide of cumyl (bromocuminol 1). (Bertagnini.)

It does not dissolve in concentrated solutions of the sulphites, or

(slightly, Trapp) in cold alcohol or in ether. (Bertagnini.)

]	Bertagnini mesa.
NaO	31	 11.48	•••••	11.84
20 C	120	 44.44		44.71
15 H	15	 5.22	****	5.33
2 S	32	 11.85		
10 O	80	 26.68		
C20H12O2,NaO,2SO2 + 3Aq	278	 100.00		

Cuminol prepared from the seeds of the water-hemlock contains 8.67 p. c. Na (calculation = 8.52 p. c.). (Trapp.)

Cuminic Acid.

$C^{20}H^{12}O^4 = C^{20}H^{12}, O^4$

GERHARDT & CAHOURS (1841). N. Ann. Chim. Phys. 1, 70; J. pr. Chem. 23, 329; Ann. Pharm. 38, 76.

Persoz. Compt. rend. 13, 431; J. pr. Chem. 25, 55; Ann. Pharm. 44,

GERHARDT. Compt. chim. 1, 75; N. Ann. Chim. Phys. 37, 404; Ann. Pharm. 87, 77.

Cahours. Compt. rend, 24, 554; N. Ann. Chim. Phys. 25, 36; Ann. Pharm. 69, 243; N. Ann. Chim. Phys. 23, 347; J. pr. Chem. 45, 144; abstr. Ann. Pharm. 70, 45; N. Ann. Chim. Phys. 52, 201.
Fr. Field. Ann. Pharm. 65, 51; Mem. Chem. Soc. 3, 408; J. pr. Chem.

44, 136.

A. W. HOFMANN. Ann. Pharm. 74, 344; further, 97, 197.

CHIOZZA. N. Ann. Chim. Phys. 39, 219. KRAUT. Dissert. über Cuminol und Cymen, Gött. 1854; Ann. Phara-98, 366; N. Br. Arch. 96, 274.

Acide cuminique. — Acide cyminique (Persoz), Cuminidure. Discovered by Gerhardt & Cahours. The acid observed by Chevalier (x, 109) in Roman cumin od which had become acid by exposure to the air was, doubtless, cuminic and not succiase acid. (Kr.)

Produced by the oxidation of cuminol by air, moist Formation. bromine or chlorine, nitric acid or chromic acid; with evolution of hydrogen, when cuminol is fused with hydrate of potash. (Gerhardt & Cahours.) With simultaneous formation of cuminic alcohol (Kraut): by the action of water, or of aqueous (Gerhardt & Cahours), or alcoholic potash on cuminol. — From cuminic alcohol, by oxidation with nitric acid; by fusing it with hydrate of potash, hydrogen being evolved; by boiling it with alcoholic potash, cymene being simultaneously produced. (Kraut.)

Preparation. Hydrate of potash is fused in a retort, into the tubulus of which a funnel-tube, drawn out to a fine point, has been fitted, and caminol or Roman cumin oil is gradually dropped into the retort, each drop becoming solid and white as it comes in contact with the hydrate of potash, while (if Roman cumin oil be used) cymene distils over. When all the cumin oil is decomposed, the residue is dissolved in water, and any unvolatilised cymene that may be present is removed with a pipette. Nitric acid in slight excess is then added, whereby cuminic acid is precipitated in white or yellowish flakes; these are collected on a filter, washed and fused in a dish; the fused mass, which solidifies on cooling, is separated from adhering water and distilled per se; and the distillate is crystallised from alcohol. — If it is not required to collect the cymene, the Roman cumin oil may be dropped on potash fused in a dish, whereby the operation may be more rapidly conducted. (Gerhardt & Cahours.)

When the hydrate of potash is fused in glass retorts, the vessels are rapidly corroded; and the use of an open dish occasions much loss from the volatilisation of cuminol; it is therefore preferable to decompose Roman cumin oil with alcoholic potash, so that the cuminic alcohol at first formed may be completely decomposed into cuminic acid and cymeno (Kr.) — Persoz heats Roman cumin oil with a mixture of 5 pts. bichromate of potash, 11 pts. oil of vitriol, and 40 pts. water, whereby a distillate containing acetic acid and a mixture of cuminic and insolinic acids is obtained (xiii, 319), and is separated by alcohol, in which insolinic acid is insoluble.

Properties. Beautiful, white, tabular prisms. (Gerhardt & Cahours.) (Rhombic, according to Persoz.) Melts at 115°. (Persoz, Gerhardt.) In the earlier investigations of Gerhardt and Cahours, its melting point was found to be 92°; but this acid contained cyn.ene. (Gerhardt, Compt. rend. 20, 1443.)— It floats on boiling water as a colourless oil, which solidifies on cooling. Boils above 250°, but volatilises with the vapour of water. Sublimes readily without decomposition in beautiful long needles. The vapour has an acid suffocating smell. Tastes strongly acid (it is tasteless, Persoz), and has a faint odour of bugs. (Gerhardt & Cahours.)

c	rystal	s.		(Gerhardt Cahours <i>mean</i> .	&	Hofmanı	ı. (Gerhardt.
20 C	120	•	73.17	••••	73.12		~2.66		72.91
12 H	12	••••	7.32		7.53		7:37		7:38
40	32		19.51	•••••	19:35	••••	19.97	••••	19.71
C20H12O4	164		100.00	•	100.00	••••	100.00	••••	100.00

Hofmann analysed cuminic acid which had passed unchanged through the system into the urine; Gerhardt the acid obtained from aceto-cuminic anhydride. It is isomeric with sugenic acid.

Decompositions. 1. Cuminic acid is converted by boiling fuming nitric acid (and by cold nitrosulphuric acid: Kraut) into nitrocuminic acid; by heated nitrosulphuric acid, into binitrocuminic acid. (Cahours.)—2. By pentachtoride of phosphorus, into chloride of cumyl. (Cahours.) Its soda-salt mixed with terchloride of phosphorus forms chloride of cumyl and phosphite of soda. (Gerhardt.) Chlorophosphoric acid converts cuminate of soda into cuminic anhydride. (Gerhardt.)—4. By boiling with bichromate of potash and sulphuric acid, it is converted into insolinic acid. (Hofmann.)—5. By dry distillation with excess of caustic baryta, it is decomposed into carbonate of baryta and cymene. (Gerhardt & Cahours.)—6. It passes through the system unchanged into the urine. (Hofmann.)—7. The potash-salt heated with bromide of cyanogen yields cumonitrile and bromide of potassium. (Cahours.)—8. The soda-salt heated with chloride of acetyl, benzoyl, or cumyl, forms the corresponding conjugated anhydride. (Gerhardt.)

Combinations. The acid is scarcely soluble in cold water, slightly in boiling water, from which it is deposited on cooling. (Gerhardt & Cahours; Persoz.)—It is more soluble in acidulated water, hence it must not be precipitated with too much nitric acid. (Gerhardt and Cahours.)

Dissolves in strong sulphuric acid without coloration. If the acid has not been purified by sublimation and then by crystallisation from alcohol, it still contains an oil, and turns red with sulphuric acid. (Gerhardt & Cahours.)

Cuminic acid forms salts with bases: Cuminates. They resemble the benzoates. (Persoz.) — It decomposes the alkaline carbonates. (Gerhardt & Cahours.)

Cuminate of Ammonia. Friable tufts, becoming dull in the air, probably from loss of ammonia. (Gerhardt & Cahours.) It is decomposed by heat, partly into cuminic acid and ammonia, partly into cuminamide and cumonitrile. Heated in a sealed tube, or heated almost to fusion for a long time in a retort, it is for the most part principally converted into cuminamide, and when rapidly distilled, into cumonitrile. (Field.)

Cuminate of Potash. Ill-defined, deliquescent crystals. (Gerhardt & Cahours.)

Cuminate of Baryta. Carbonate of baryta is decomposed by cuminic acid. The concentrated solution, filtered hot, deposits immediately on cooling, nacreous scales, each of which at the moment of its formation exhibits the prismatic colours. Tastes very bitter; dissolves readily in alcohol and in other. (Gerhardt & Cahours.)

		Drie	d at 10	0°.		Gerha	rdt & Cahours	ı
	20 C .			****	29.61 51.82 4.75 13.82	********	29.88 51.41 4.81 13.90	
Ī	C20H11H	aO1	231.6	****	100.00	*******	100-00	

Cuminate of Copper. Greenish powder, becoming stongly electric by pressure. Remains unchanged at 250°. Melts at 260°, and swells up slightly, without volatilising. The residue contains a small quantity of metallic copper, cuminic acid, cuprous cuminate, and a coppersalt, which, when decomposed by acids, deposits a semi-fluid oil. (Chiozza.) By dry distillation, it yields cuminic acid and cymene. (Kraut.)

Cuminate of Silver. Nitrate of silver gives with cuminate of ammonia a white curdy precipitate which rapidly blackens in the light. Subjected to dry distillation, it yields carbonic acid and cuminic acid (part of which is decomposed into carbonic acid and cymene), and leaves a residue of charcoal and carbide of silver, the latter remaining unchanged even when the salt is ignited in the air.

Drie	d at 10	0°.		Gerha	ardt & Cahours. mean.
Ag 20 C					
11 H					
40	32.0	••••	11.86	•••••	11.64
C20H11AgO4	271.0		100.00		100.00

When prepared with cuminic acid obtained by acting on cuminic alcohol with aitric acid, it contains 39.69 p. c. Ag. (Kraut.)

Cuminic acid is readily soluble in alcohol and ether, and crystallises from the solutions by evaporation. (Gerhardt & Cahours, Persoz.) It dissolves in warm glacial acetic acid in all proportions, and crystallises therefrom on cooling. (Persoz.)

Oxycuminic Acid.

 $C^{20}H^{12}O^6 = C^{20}H^{12}, O^6$?

CAHOURS. N. Ann. Chim. Phys. 53, 338; Ann. Pharm. 109, 20.

Acide oxycuminique.

Formation and Preparation. Amidocuminic acid is dissolved in excess of moderately concentrated nitric acid, and nitric oxide is passed through the solution; whereupon nitrogen gas is evolved, and, after prolonged action, oxycuminic acid is obtained.

Properties. Small, yellowish brown prisms.

C50H13O4	180	 100.00	 100.00
6 O	48	 26.68	 27.01
12 H	12	 6.66	 6.81
20 C	120	 66.66	 66.18
			Cahours

It bears the same relation to cuminic acid as glycolic (xii, 508) to acetic acid. Dissolves sparingly in cold, readily in boiling water.

Combines with salifiable bases, forming compounds some of whice crystallise well.

Oxycuminate of Silver. Yields on ignition 37.41 p. c. Ag, corresponding to the formula C²⁰AgH¹¹O⁶, which requires 37.63 p. c. Ag. Oxycuminic acid is more readily soluble in alcohol than in water.

Chlorocumol.

$C^{20}H^{12}Cl^2 = C^{20}H^{12},Cl^2.$

CAHOURS. (1848.) N. Ann. Chim. Phys. 23, 345; J. pr. Chem. 45,

143; abstr. Ann. Pharm. 70, 44.

J. P. SIEVEKING. Dissert. über Cuminol und Cymen, Gött. 1857; abstr. Ann. Pharm. 106, 258; J. pr. Chem. 74, 505.

J. TUTTSCHEFF. Petersb. Acad. Bull. No. 392; J. pr. Chem. 75, 370; abstr. Rep. Chim. pure. 1, 268.

Chlorocuminol.

Formation and Preparation. Pentachloride of phosphorus reacts violently and rapidly on cuminol; the mixture becomes hot, and yields by distillation oxychloride of phosphorus boiling at 111°, and chlorecumol, leaving but a small residue. The portion distilling between 250° and 265° is collected apart, washed with water and dilute potash till all traces of oxychloride of phosphorus have been destroyed; then again with water; afterwards dried over chloride of calcium and rectified. (Cahours.) In the action of pentachloride of phosphorus on cuminol, charcost deposited. (Tuttscheff.) If the product obtained from equal numbers of atoms of pentachloride of phosphorus and cuminol be heated to 150°, after the oxychloride of phosphorus has distilled over, it blackens, evolves large quantities of hydrochloric acid, and on being further heated to 250° or 260°, yields scarcely any chlorocumol. It is and on being further heated to 250° or 260°, yields scarcely any chlorocumol. It is therefore preferable to place 5 pts. pentachloride of phosphorus in a tubulated retort, into the tubulus of which a glass tube is fitted by means of a perforated cork, and to connect with this a dropping burette, by which 2 pts. cuminol may be introduced by small portions. After the action has ceased, the whole is heated to 150°, or till almost all the oxychloride of phosphorus has passed over, and the residue is mixed with water; whereupon the chlorocumol is deposited at the bottom of the vessel. This is collected, carefully separated from adhering water, and distilled by itself. The portion distilling between 250° and 260°, amounting to 3 the of the cuminol employed, is collected another. between 250° and 260°, amounting to 2ths of the cuminol employed, is collected apart. (Sieveking.)

Properties. Limpid liquid, heavier than water. (Cahours.) Boils between 255° and 260° (Cahours) at 255°, with slight decomposition, evolving hydrochloric acid and depositing charcoal. (Tüttscheff.) It smells like chloride of benzoyl (Cahours); penetrating, and not disagreeable. (Sieveking.)

					Cabours
					mean.
20 C	120	••••	59.11	•••••	60.01
12 H	12	•	5.91	•••••	6.11
2 Cl	71	••••	34.98		34.18
C-"H'2Cf2 2	03	•	100.00		100.30

Decompositions. 1. Heated with alcoholic ammonia in a sealed tube, it forms chloride of ammonium and a thick yellow oil. (Sieveking.) it forms chloride of ammonium and a thick yellow oil. (Sieveking.)—
2. It does not appear to be decomposed by aqueous potash. (Cahours.)
— 3. With hydrosulphate of potassium, it yields chloride of potassium, and a viscid product of repulsive odour. (Cahours.)—The alcoholic solution, treated for some time with sulphide of ammonium, yields a dark red resin soluble in ether. (Sieveking.)—4. By freshly precipitated oxide of silver it is converted into cuminol. (Tüttscheff.)—5. When 2 At. ethylate of soda are heated with 1 At. chlorocumol, chloride of sodium and a red liquid are obtained. When this product is distilled, first alcohol, and then, between 170° and 238°, an oil passes over, which behaves with alkaline bisulphites like cuminol. (Sieveking.)—6. With acetate of silver, it forms acetate of cumo-glycol (Sieveking); with benzoate of silver, benzoate of cumo-glycol. (Tüttscheff.) of silver, benzoate of cumoglycol. (Tüttscheff.)

Insoluble in water. (Cahours.) Readily soluble in alcohol and in

ether. (Cahours.)

Conjugated compounds of the Primary Nucleus, C20H12.

Acetate of Cumoglycol.

 $C^{26}H^{16}O^{6} = 2C^{4}H^{3}O^{3}, C^{20}H^{12}O^{2}.$

J. P. Steveking. (1857.) Dissert. über Cuminol und Cymen, Gött, 1857; Ann. Pharm. 106, 258; J. pr. Chem. 74, 505.

Acetate of Cumylene. Essigsäure Cumol-ather.

Preparation. Chlorocumol is mixed with excess of acetate of silver, and the reaction, which immediately ensues, is finally aided by a gentle heat. The product is treated with ether; the solution evaporated; and the residue washed with aqueous carbonate of soda, and crystallised from ether, whereby yellowish crystals, contaminated with an oil, are obtained.

Properties. Colourless crystals, resembling the swallow-tail crystals of gypsum. Melts at a moderate heat, and diffuses a powerful odour of acetic acid and cuminol.

				S	mean.
28 C	168		67.2		70-7
18 H	18		7.2	*******	7.5
80	64	****	25.6		21.8

It gave too much carbon in the analysis, owing to the presence of an oil.

Benzoate of Cumoglycol.

 $C^{44}H^{22}O^{4} = 2C^{14}H^{4}O^{3}, C^{20}H^{12}O^{2}.$

J. Tüttscheff. Peterso. Acad. Bull. No. 392; J. pr. Chem. 75, 370.

Bibenziate of Camol; Benzoste of Camplene.

Formation and Preparation. Seven pts. chlorocumol are mixed in a porcelain dish with 16 pts. benzoate of silver; the mass thereby formed is treated with ether, which leaves the chloride of silver undiscolved; and the resulting solution of benzeate of cumoglycol is left to evaporate spontaneously, whereupon a brownish yellow oil, solidifying in crystals in a few days, is deposited. This is pressed between paper, washed with aqueous ammonia, and recrystallised alternately from ether-alcohol and absolute alcohol.

Properties. Brilliant, colouriess needles, melting at 88°, and solidifying in crystals on cooling.

				Tittecheff
		Necia.		meen.
45 C	_	. 255	. : :::-61	76.94
22 H	· - -	_ 22	5-53	5.93
80		₹4	. 17:11	17-13
20011	た ⁽ など:5元	374	1/12-00	. 100-00

Decompositions. It cannot be volatilised without decomposition.—
2. It is dissolved by cold suppliers and with dark redcolour; the solution blackens by boiling — 2. It is not attacked by boiling name and, -4. It is not affected by ananowa or by concentrated baryta-mater. - 5. Distilled with cases operate it yields benzonte of potash and cuminol.

Dissolves in allowing especially in warm strong alcohol, and is precipitated by water. Dissoives readily in older, across, and chloroform.

Cumyl

 $(AH_{a}G_{b} = G_{a}H_{a}G_{a}H_{b}G_{b}G_{b})$

CHIOZZA. (1852.) Compare real 83, 225. Aug. Phirm. 84, 102; J. pt. ('A. a. 37, 178; in detall, N. Ann. Ch m. Fige. 39, 216.

Chaper.

Formation 1. By heating commel with chloride of cample The reaction takes place only at a high temperature, at which the hydrochlore and evolved further decompletes the camp, and turns it brown. 2 Cuminol-petassium is heated with chloride of cumvl. — 3. Cuminol-petassium is acted upon by colonic of our vi. whereby an uncrystal-de oil is formed, which when heated with a ne petash, yields

together with other products

Preparation. To freshly prepared cuminol-potassium (p. 147), an equivalent quantity of chloride of cumyl is added; whereupon the mixture liquifies, and when gently heated, becomes pasty, and deposits chloride of potassium. The excess of chloride of cumyl and any cuminic anhydride that may have been formed are removed by washing the product with weak potash; the mixture is shaken with ether, which takes up the cumyl; the ethereal stratum is decanted, and dried over chloride of calcium; and the ether is evaporated over the water-bath.

Properties. Viscid oil. Cooled to -18° in a freezing-mixture, it solidifies in a clear, uncrystalline mass. Heavier than water. It has a faint odour at ordinary temperatures, and an agreeable odour of geraniums when heated.

				_		
				a. mean.		ь.
40 C	240	••••	81.6	 80.55	••••	81.5
22 H	22		7.5	 7.97	••••	7.8
4 0	32	••••	10.9	 11.48	••••	10.7

a was obtained by method 2, b by method 3.

Decompositions. 1. Cumyl takes fire with difficulty and burns with a smoky flame. —2. Heated above 300°, it decomposes with ebullition, into cuminic acid and other products poorer in oxygen, leaving a residue of charcoal. — 3. It is attacked by cold strong sulphuric acid, and on heating the mixture, it blackens and gives off sulphurous acid. - 4. Dissolves in fuming nitric acid without evolving red vapours, and on addition of water, a yellow, neutral, soft resin is deposited, with which flakes of cuminic acid mix as the liquid cools. — 5. Gently warmed with fragments of caustic potash, it is decomposed into cuminol and cuminate of potash. Alcoholic potash exercises the same action. It is likewise attacked by aqueous potash, but more slowly, and when boiled with it, is converted into an oil containing 81.6 p. c. C & 8.6 p. c. H.

It is scarcely soluble in cold, readily in boiling alcohol.

Cuminate of Ethyl.

 $C^{26}H^{16}O^{4} = C^{4}H^{5}O, C^{20}H^{11}O^{3}.$

GERHARDT & CAHOURS. (1841.) N. Ann. Chim. Phys. 1, 77. CAHOURS. N. Ann. Chim. Phys. 23, 348.

Cuminic ether, Ether cuminique, Cuminvinester.

Formation and Preparation. 1. A solution of cuminic acid in absolute alcohol is saturated with gaseous hydrochloric acid; the chloride of ethyl and excess of alcohol are expelled by heating the liquid on a water bath; the ether is distilled off; and the distillate is washed with carbonate of soda and rectified over oxide of lead. (Gerhardt & Cahours.) -

156 CONJUGATED COMPOUNDS OF THE PRIMARY NUCLEUS CPHP.

2. When chloride of cumyl is added to strong alcohol, the mixture becomes hot, and on addition of water, deposits cuminate of ethyl. (Cahoura.)

Properties. Colourless liquid. Lighter than water. Boils at 240°. Vapour density = 6.35. It has a very agreeable odour of pippins.

				Gerbi	rdt & Co mean.	hours.
21 C	144		73-00	*******	74.45	
lö H						
40						
C.H.O'C. H.C) ² 19 2	1	00-00		100-00	
		Vol	L.	De	nsity.	
C-vapuer		. 24		9.	9840	
H-(**		. 16		1·	1088	
()-tae	······································	. 2		2·	2186	
Ether-vapou	r	. 2		13·	3114	
				6·		

Prosuppositions. The vapour is readily inflammable, and burns with a blueish thane. — Heated with potast, it yields alcohol and cuminate of notash. (Gerhard: & Cahours.)

potash. (Gerhardt & Cahours.)
Insoluble in souter. Dissolves in every proportion in alcohol and in other. (Gerhardt & Cahours.)

Acetocuminic Anhydride.

 $(^{20}H^{14}()^{3} = (^{4}H^{3}O^{3}, C^{20}H^{11}O^{3},$

GERHARDT. (1832.) Compt. rend. 34. 904; Ann. Pharm. 83, 114; in detail, N. Ann. Chim. Phys. 37, 304; Ann. Pharm. 87, 82.

Cuminate actique, Actute cuminique, Anhydrous Cuminacetic Acid.

Obtained in the same way as acetobenzoïc anhydride (xii, 95), from cuminate of soda and chloride of acetyl.

Properties. Neutral oil having an agreeable odour of Spanish wine. Heavier than water.

					Cabours.
24 C	144	***	69-90	******	70.14
14 H	14	••	6.80		6.93
6 O	48	••••	23.30		22-93
C4H3O3,C29H11O3	206	<u> </u>	100.00		100-00

Decompositions. 1. When moist, it rapidly becomes acid, depositing so of cuminic acid, and diffusing an odour of acetic acid. — 2. It is seed by distillation into acetic anhydride and cuminic anhydride. By alkalis it is converted into a mixture of cuminate and acetate.

Cuminate of Phenyl, $C^{32}H^{16}O^4 = C^{12}H^5O, C^{20}H^{11}O^3.$

WILLIAMSON & SCRUGHAM. Phil. Mag. 7, 370; Chem. Gaz. 1854, 193;
Ann. Pharm. 92, 316; J. pr. Chem. 62, 365; Pharm. Centr. 1854,
506; N. Ann. Chim. Phys. 41, 491.

KRAUT. Dissertation, Gött. 1854; N. Br. Arch. 96, 272.

Cuminsaure-Carbolsäure, Cumyl-phenyl.

Formation. By the action of chloride of cumyl on phenylate of potash. (Williamson & Scrugham.) - By the dry distillation of cumo-salicylic acid, or of a mixture of chloride of cumyl and salicylate of soda in equal numbers of atoms. (Kraut.)

Preparation. 16 pts. salicylate of soda are heated with 181 pts. chloride of cumyl in a retort, at first gently, till the mixture has become pasty and the odour of chloride of cumyl has disappeared, then more strongly, as long as oil continues to pass over. The distillate is heated to boiling with dilute aqueous potash, whereupon cuminic and carbolic acids dissolve in the potash, and cuminate of phenyl is deposited on cooling as a crystalline mass which is purified by washing, freezing, and repeated recrystallisation from alcohol. (Kraut.)

Properties. Long, white needles, melting between 57° and 58°. Distils without decomposition. It has an agreeable odour, resembling that of benzoate of phenyl, especially when heated.

					Kraut.
32 C	192		80.00		80.58
16 H	16		6.60		6.87
40		****	13.40	********	12.55

Decompositions. 1. When a mixture of cuminate of phenyl and nitrate of soda is heated with strong sulphuric acid, binitrocuminic acid (and probably nitrocuminic acid) is formed. (Kraut.)-2. It is resolved by strong sulphuric acid into cuminic acid and sulpho-carbonic acid. (Kraut.) - 3. It is not decomposed by aqueous potash, but alcoholic potash decomposes it, yielding cuminate and phenylate of potash. (Kraut.)

It is insoluble in water. Dissolves readily in hot alcohol and in

Benzo-cuminic Anhydride. $C^{34}H^{16}O^6 = C^{14}H^6O^3, C^{20}H^{11}O^3.$

GERHARDT. (1852.) Ann. Pharm. 82, 114; N. Ann. Chim. Phys. 37, 285; Ann. Pharm. 87, 79.

Anhydrous Benzocuminic acid, Cuminate of benzoyl, Benzoate of cumyl, Wasserfreie Benzoesäure-Cuminsäure.

Preparation. 20 pts. dried cuminate of soda are heated in a retort with 15 pts. chloride of benzoyl, till the odour has disappeared; after which the whole is allowed to cool. A thick, almost colourless syrup is thus obtained, which is warmed with water to dissolve out the chloride of sodium; whereupon the benzo-cuminic anhydride collects at the bottom of the vessel as an oil. This is washed first with aqueous carbonate of soda, then with water, and after pouring off the water, dissolved in ether and gently warmed till the ether and adhering water have evaporated.

Properties. Thick, almost colourless and inodorous oil. Sp. gr. = 1·115 at 23°. Heated in open vessels, it appears to volatilise without decomposition, and yields very pungent vapours.

34 C	204	76.19		
		/012		75.89
16 H	16	 5.97		6.18
6 O	48	 17.91	•••••	17.93

Decompositions. 1. When kept moist, it turns acid. 2. It cannot be distilled without decomposition, but yields an acid, buttery distillate solidifying in the neck of the retort. 3. Ammonia converts it into benzamide, or benzoate of ammonia, and cuminamide. 4. By alkalis it is converted into a mixture of benzoate and cuminate.

Cumosalicyl.

 $C^{34}H^{16}O^6 = C^{16}H^5O^3, C^{20}H^{11}O^3.$

Cahours. Compt. rend. 44, 1252; Ann. Pharm. 104, 109; in detail, N. Ann. Chim. Phys. 52, 197; Ann. Pharm. 108, 317.

Cumosalicyle.

Formation and Preparation. Chloride of cumyl does not act in the cold on salicylous acid; but on applying heat, abundance of hydrochloric acid is evolved, and solid cumosalicyl is formed, which is purified by pressing between blotting paper, washing with warm aqueous potash and boiling water, and repeated recrystallisation from strong alcohol.

Properties. Brilliant, colourless, friable prisms, melting at a gentle heat to a clear oil, and solidifying on cooling.

					Cahours.
34 C	204		76.1	••••	75.79
16 H	16	·	5.9	••••••	5.97
6 O	48		18.0		18.24
CuffrOs Cs	H ¹¹ O ³ 268		100.0		100.00

It is attacked by chlorine, bromine, and fuming nitric acid, giving rise to crystallisable products. It is not attacked by solid constic potash or rus potash, either in the cold or when heated.

ble in cold, slightly soluble in boiling water.

ves in alcohol, especially in warm alcohol. Dissolves readily in

Cuminate of Methyl-salicyl. C**H**O* = C**H**O,C**H**O*,C**H**O*.

Gerhardt. (1854.) Compt. rend. 38, 32; Ann. Pharm. 89, 362; Chem. Centr. 1854, 131; Traité, 3, 327.

Cuminsaure Methylsalicylsäure,

When chloride of cumyl is heated with salicylate of methyl, a viscid oil is obtained, which crystallises when mixed with ether, and evaporated.

Properties. Crystallises from alcohol in very brilliant laminæ, and from ether, by spontaneous evaporation, in thick, oblique prisms. It is deposited from its hot saturated alcoholic solution as an oil which remains fluid for a long time.

Insoluble in water, slightly soluble in cold alcohol. Very soluble in

ether.

Oenantho-cuminic Anhydride.

 $C^{34}H^{34}O^{6} = C^{14}H^{15}O^{3}, C^{20}H^{11}O^{3}.$

Chiozza & Malerba. Ann. Pharm. 91, 102; Chem. Centr. 1854, 793; J. pr. Chem. 64, 32.

Cumyl-ocnanthylal, Anhydrous Oenantho-cuminic acid, Oenanthylate of Cumyl.

Obtained by the action of chloride of cumyl on oenanthylate of

potash.

Colourless oil, smelling feebly of apples and slightly aromatic in the cold. Lighter than water. Heavier than water (Chiozza & Malerba). (Gerhardt, Traité, 3, 601.) When heated, it yields vapours which attack the organs of respiration.

					Chion	za & b
34 C		204		73.91	••••	74.0
24 H		24	••••	8.69	•••••	8.2
6 O	•••••	48	• · · · •	17.49	••••	17.8
CHILI	3O3,C30{1111O3	276		100:00		100.0

Cuminic Anhydride.

 $C^{40}H^{22}O^6 = C^{20}H^{11}O^3, C^{20}H^{11}O^3.$

Gerhardt. (1852.) Compt. rend. 34, 904; Ann. Pharm. 83, 114; more detailed, N. Ann. Chim. Phys. 37, 304; Ann. Pharm. 87, 77.

Anhydrous cuminic acid, Cuminate cuminique.

Formation. 1. By the action of chloride of cumyl on cuminate of soda. — 2. By the action of oxychloride of phosphorus on cuminate of

The state of state to the state of solium; The state of solium; The state of solium; The state of solium;

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Jacobson at Empire 1 where 1 is gradually becomes filled with collision and the form of an arrange completely converted. For any antiquest of a gradually converted into solid communities.

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CAP. TES DE 2 10 DE DE DE LES PROPER 109, 31.

Figure 1 11 For Local Theorem in removed of glycocol and extent of source removed the coloride of silver is firmed the color with the coloride of silver is an extended the warm alcohol and experiences at the transfer of the virial results brown prisms. The product a particle of pressure between blotting paper and recrystallisation.

14 C N 15 H 6 O	144	55 13 6 33 6 75 21 74	C120ars. 64:91 6:65
C-NH-O	223	100:20	

It bears the same relation to cuminic acid, as hippuric to benzoic

acid.

Boiled with hydrochloric accidit takes up water and is converted into cuminic acid and hydrochlorate of glycocol.

Cuminurate of silver contains 32.61 p. c. Ag (C"AgNH"O" = 32.92 p. c.).

Cuminuric acid dissolves in alcohol, especially when warm.

Oxygen-nucleus C20H10O2.

Sassafras-Camphor. $C^{20}H^{10}O^4 = C^{20}H^{10}O^2,O^2$.

BINDER. (1821.) Repert. 11, 346.

SAINT-EVRE. N. Ann. Chim. Phys. 12, 107; J. pr. Chem. 34, 372; abstr. Compt. rend. 18, 735; N. J. Pharm. 10, 314.

In oil of Sassafras. Rectified oil of sassafras is cooled by an artificial freezing mixture, and the crystals, which are deposited after a few hours from the turbid liquid, are collected, pressed between paper, melted, and recrystallised by means of a freezing mixture. (St. Evre.)

Hard, white, oblique four-sided or irregular six-sided prisms, bevelled

with two faces, and somewhat truncated on the bevelling edge.

It crackles when pressed together. Sp. gr. = 1.245 at 6°; 1.11 in the liquid state at 12° 5′. It remains liquid at 5°, but solidifies below 17°; solidifies at 7.5°. (Binder.) — Vapour-density = 5.85. (St. Evre.) It has an odour of sassafras, and tastes at first sweetish and warm,

afterwards burning. (Binder.)

					Note:		St. Evre		
20 C 10 H									
40	32	100	19.76	******	19.53	****	19.82	****	19.83
C20H10O4	162	****	100.00	*******	100.00	****	100.00	****	100.00

It becomes rapidly altered in the air. (St. Evre.) — When set on fire, it burns with a very smoky flame. — Mixed with nitric acid, it turns yellow, dissolves with reddish brown colour, and is partly converted into a brown viscid resin. - With fuming sulphuric acid it effervesces, evolving sulphurous acid and depositing spongy charcoal. (Binder.)

Appendix to Sassafras-camphor.

Oil of Sassafras.

BINDER. (1821.) Repert. 11, 346. Bonastre. J. Pharm. 14, 645; abstr. J. Chim. mid. 4, 484; N. Tr. 19, 1, 210.

SAINT-EVRE. N. Ann. Chim. Phys. 12, 107; J. pr. Chem. 34, 372; abstr. Compt. rend. 18, 735; N. J. Pharm. 10, 314. ZELLER. Stud. über aether. Oele., 1850.

Essence of sassafras.

Source and Preparation. Occurs in the wood and bark of the roots of Laurus sassafras L. - The wood is rasped and distilled with water, and the oil which sinks to the bottom of the aqueous distillate is collected.

Commercial oil of sassafras is generally adulterated (a) with oil of VOL. XIV.

lavender; it is then specifically lighter than the pure oil; (b.) with all of turpentine, which, when the oil is submitted to distillation, passes over and floats on the distillate; c with oil of cloves, the impurity remaining in the residue, when the oil is distilled with potash.

Properties. Yellow (St. Evre); varies between pale-brown and reddish yellow. (Zeller.) — Sp. gr. = 1.09 at 10° (St. Evre), between 1.07 and 1.09. (Zeller.) — Begins to boil at 115°, the boiling point rising to 228°, when it remains nearly constant. (St. Evre.) — It has an odour of femel and a sharp (St. Evre.), fiery taste. (Bonastre.) — It is neutral. (Zeller.)

C	72.19
Н	6.40
0	21-41

The analysis corresponds to the formula C¹⁵H¹⁰O²,* but oil of sassafras is a mixture (St. Evre) of two oils, one heavier, the other lighter than water. (Bonastre.)

Decompositions. 1. When kept for some time or cooled, it deposits crystalline sassafras-camphor. (Binder, St. Evre.) 2. On distillation, it leaves a brownish yellow residue. (St. Evre.) — 3. Distilled through a tube heated to redness or ever heated sodu-lime, it yields naphthalin and phenylic alcohol. (St. Evre.) — 4. Saturated with chlorine, it becomes opaque, milky, and viscid. (Bonastre.); evolves hydrochloric acid and is converted into a viscid mass containing common camphor. (Faltin, Ann. Pharm. 87, 376.) — 5. It is violently attacked by bromine, being converted into bromide of oil of sassafras and evolving hydrobromic acid. (St. Evre.) — 6. With iodine, it turns yellowish brown without becoming viscid. — 7. Mixed with cold nitric acid, it gradually becomes fleshcoloured (Bonastre), reddish brown with slight elevation of temperature (Zeller.) With hot nitric acid it turns red (Daryk); warmed with weak nitric acid, it yields oxalic acid (Daryk, St. Eyre); with moderately concentrated acid, a brittle resin. (Zeller.) It readily takes fire with fuming nitric acid (St. Evre), leaving a brown resin. (Hasse, Crell. Ann. 1785, 1,422.) — 8. Treated with strong sulphuric acid, it frequently takes fire, and is converted into a red, acid resin, mixed with charcoal. (St. Evre.) Mixed with \(\frac{1}{2} \) pt. strong sulphuric acid, it turns greenish, yellowish-brown. (Zeller.) - 9. Saturated with sulphurous acid, it turns green, and afterwards orange-coloured, deposits sulphur, becomes hot, and yields a mixture which on standing separates into two strata, the upper, consisting of undecomposed oil, the lower of an oil boiling at 235°, and represented by the formula C¹ºH¹⁰O³. If the action of sulphurous acid be continued for a longer period, an oil containing sulphur is formed, corresponding in composition to the formula C2"H2"O2S. - 10. It is not altered by phosphoric anhydride. - 11. Distilled with pentachloride of phosphorus, it is converted into chloride of oil of sassafras, with violent evolution of hydrochloric acid. — 12. It is not attacked by potassium. — 13. Saturated with ammonia it yields bulky prisms containing 73:17 p. c. C, 6:18 p. c. II, and 20:65 (). (St. Evre.) Cooled oil of sassafras is rendered turbid by

This is wrong, C⁶H⁶O⁷ = 80°60 C, 7°16 H, 11°94; perhaps it is C⁸H⁶O⁸ = 72°00 C; 6°66 H; and 21°340.

ammonia, and becomes viscid, but not crystalline. (Bonastre.)—14. It is not altered by bichromate of potash and sulphuric acid (St. Evre); deposits yellowish-brown, resinous flakes. (Zeller.)—15. It is not affected by chloride of zinc. (St. Evre.)

Combinations. Dissolves in 4 or 5 pts. alcohol of sp. gr. 0.85, and sparingly in aqueous alkalis. (Zeller, Bonastre.)

Oxygen-nucleus C20H8O4.

Pyroxanthin.

C20H6O4 ?

Scanlan. (1855.) Phil. Mag. J., [3], 41, 395; also J. pr. Chem. 7, 94.

Арзонк & Gregory. Proc. of the Roy. Irish Acad. 1836, 33; J. pr. Chem. 13, 70.

SCHWEIZER. J. pr. Chem. 44, 129.

Eblania. Discovered simultaneously by Pasch & Scanlan (1835), and named after the place of residence of the latter. (Dublin, lat. Eblana.)

Formation. 1. By heating the precipitate formed by lime in crude wood-spirit. — 2. By saturating the most volatile portion of crude wood spirit with lime, and heating. — 3. By the action of potash on the pyroxanthogen contained in crude pyroligneous acid. (Schweizer.)

Preparation. 1. Crude wood spirit is distilled till 15 p. c. has passed over; the distillate containing acetic acid is saturated with lime and redistilled; and from the dry, dark-coloured residue, consisting of acetate of lime, lime, brown resin, and pyroxanthin, the first two substances are extracted with hydrochloric acid, after which it is repeatedly boiled with alcohol. The first extracts contain almost exclusively a brown resin, smelling like pitch; the last contain principally pyroxanthin; these are evaporated, and the crystals thereby deposited are recrystallised from alcohol. (Apjohn & Gregory.)—2. The most volatile part of crude pyroligneous acid (from ash-wood) is distilled in a water-bath, till the distillate will scarcely take fire, and the residue is distilled alone over a naked flame, till nothing but water containing acetic acid passes over. This second distillate is supersaturated with potash, and the orange-yellow flakes thereupon deposited are washed on a filter, first with water, and then repeatedly with a small quantity of hot alcohol, to remove the resin, which is especially deposited when the liquid has been nearly saturated. It is then dissolved in boiling alcohol, and the crystals deposited on cooling are recrystallised from alcohol. If the floculent precipitate produced by potash is immediately crystallised from alcohol instead of being first washed with a small quantity of warm alcohol, in order to remove the greater part of the adhering resin, the crystals obtained are difficult to purify. (Schweizer.)

Properties. Long, yellow needles which begin to sublime in a current

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- 3	35	YC+	I fel	_] 101~14	 100-0	100-	•

टिक्कि अकारीम् य निकास्य स्थिति अस्तरीम् अ Gaelle.

Les partly becomposed by irr process allerine between 80° and 100° into a baseless briver resin with eviluation of hydrochloric acid.—3. It is violently attacked by family above and being converted into oxide acid and a substance which explodes by heat. Dissolves in concentrated a line and without eviluation of gas; the solution mixed with water becomes a between training of gas; the solution mixed with water becomes a between training statement, which explodes by heat when infect insolves in potassis and is not reprecipitated from this solution by needly neith—4. With a lost strong suplante acid, it turns reddish by way, afterwards baselish brown and finally deposits blackish brown fixes. Strong subdirect and littled with an equal bulk of water, itselves thrownation even in a pentile heat, with fine purplered ecitive the solution after a few three deposits blackish brown fixes and its subject to the solution after a few three deposits unchanged pyroxanthic or allition of water, but after a time I see its colour especially in the air, and deposits blackish brown fixes.

At the & Gregory.

Could relieve Pyrexanthin is instable in water, slightly soluble in a page 4 pages at 1 in overest at

Pless was in providence to hear I is precipitated therefrom by water.

Disselves in alle kell and in other crystallises from the hot concentrated solution on cooling, and is precipitated therefrom by water. (Appleha & Gregory.)

Appendix to Pyroxanthin.

Pyroxanthogen.

Scieweizer. (1848.) J. pr. Com. 44, 129.

Notice and Personalism. Occars in crude pyroligneous acid. The wood spirit is first distilled from this liquid, and the residue is then distilled alone, as long as water containing acetic acid passes over. This second distillate is then mixed with other and allowed to stand for 24 hours with frequent shaking: the stratum of other swimming on the ace of the liquid is poured off and distilled; the residue is mixed with a unid the heavy brownish oil thereby precipitated is repeatedly all with water and distilled several times with water.

Properties. Transparent, colourless, or yellowish oil, heavier than water. Solidifies at -28° in a white, fatty mass. It has a disagreeable odour of smoked fish, and a strong pungent taste.

It is probably a mixture. (Schweizer.)

Decompositions. 1. It acquires a darker colour on exposure to air and light.—2. Yields a dark distillate by heat, and leaves a dark yellow and, finally, black resinous residue.—3. Its aqueous or alcoholic solution is decomposed by potash, lime, or baryta (also by carbonate of potash and by ammonia with the aid of heat); yielding (1) a precipitate of pyroxanthin; (2) a reddish-brown, easily fusible resin, insoluble in water, sparingly soluble in aqueous potash, and readily soluble in alcohol and in ether; (3) a soft resin smelling of creosote, precipitated from the solution by sulphuric acid; (4) a yellowish oil, which may be extracted from the solution by ether, resembles pyroxanthogen, but no longer yields pyroxanthin with potash; and (5) a peculiar acid.—4. It reduces mercury from mercurous salts.—5. Its alcoholic solution precipitates acetate of lead on addition of ammonia, in thick white flakes.

Combinations. Dissolves very sparingly in cold water, more readily in hot water; readily in wood-spirit, alcohol, and ether. (Schweizer.)

Bromine-nucleus C20BrH11.

Bromocuminol.

C20BrH11O2 = C20BrH11,O2.

GERHARDT & CAHOURS. (1841.) N. Ann. Chim. Phys. 1, 86.

Hydrure de bromocumyle.

Dry bromine reacts on cuminol in the same manner as chlorine, and forms bromocuminol as a heavy oil, which is readily resolved by water into cuminic acid and hydrobromic acid. The aqueous solution of bisulphite of soda and cuminol is decomposed by bromine, with formation of sulphuric acid and separation of cuminol, which is converted by excess of bromine into a crystalline, readily fusible substance, which combines with the bisulphites and is probably bromide of cumyl (bromocuminol?). (Bertagnini, Ann. Pharm. 87, 277.)

Chlorine-nucleus C20ClH11.

Chloride of Cumyl.

C20H11ClO2 = C20ClH11,O2.

Cahours. (1841.) Compt. rend. 22, 846; Ann. Pharm. 60, 254; Compt. rend. 25, 724.—N. Ann. Chim. Phys. 23, 347; J. pr. Chem. 45, 144; extr. Ann. Pharm. 70, 45.

Chloreumyl, Cumylchlorür.

Formation and Preparation. Pentachloride of phosphorus reacts on cuminic acid below 60°, evolving large quantities of hydrochloric acid,

and yields a mixture of exychloride of phosphorus and chloride of cumyl. The product is rectified, and the portion distilling between 250° and 260° is collected apart, washed with cold water, dried over chloride of calcim and rectified. (Cahours, —Oxychloride of phosphorus with 3 at cuminate of soda yields chloride of camyl. — Terchloride of phosphorus reacts at common temperatures on the alkaline cuminates, forming chloride of cumyl and an alkaline phosphite, which readily attacks the chloride of cumyl, so that the distillate is rendered impure by substances containing phosphorus. (Gerhardt, Ann. Pharm. 87, 64.)

Properties. Colourless, very mobile liquid of sp. gr. 1.07 at 15° Boils between 256° and 258°.

				Cahours.
20 C	120	••••	65.79	 65.75
11 H	11	•	6.03	 6.17
(:	33.5		19.41	 19.71
20	16	•	8.77	 8.37
erchro:	1:2:5		100.00	 100.00

Isomeric with chlorocuminol.

Decompositions. 1. It is decomposed by moist air into hydrochloric and cuminic acids. — 2. Boiled with aqueous potash, it quickly yields the same products. — 3. By dry greens ammonia (Cahours) and by carbonals of immonia (Gerhardt and Chiezza, p. 167), it is converted into cummide. — 4. It becomes strongly heated with alcohol, and, on adding water to the liquid, cuminate of ethyl is separated as a light oil. With the silverse inprend of greecel, it forms cuminuric acid (Cahours, p. 160); with planete of petash, cuminate of phenyl (Williamson & Scrugham, p. 157); with antifier, cumunilide (Cahours, p. 177); with sulphophenylaride, cumylosulphophenylamide (p. 177), and at a higher temperature, cumonitrile and sulphophenylamide (p. 177), and at a higher temperature, with silvel is acid, cumosalicyl (Cahours, p. 158); with salientate of side, cumosalicylic anhydride, and on distillation, cuminate of phenyl (Kraut, p. 157); with silveylamide, cumosalicylamide (Gerhardt & Chiozza, p. 179); with silveylamide, cumosalicylamide (Gerhardt & Chiozza, p. 179); with occumbality of potash, ocenanthocuminic anhydride (Chiozza & Malerba, p. 159); with nitrocumidiae, a crystallisable product (Cahours, p. 352); with cuminol-potassium cumyl (Chiozza, p. 154); with cuminate of potash, cuminic anhydride (Gerhardt, p. 159); with cuminic acid, cumunic anhydride (Gerhardt, p. 159); with cuminic acid, cumunic anhydride (Gerhardt, p. 159); with cuminic acid, cumunic anhydride, cumylopiperide. (Cahours.)

Chlorocuminol.

 $C_{\infty}ClH_{ii}O_{i} = C_{\infty}ClH_{ii}O_{i}$

GERHARDT & CAHOURS. (1841.) N. Ann. Chim. Phys. 1, 82.

Hidrary C. off r court.

Preparation. Dry chlorine gas passed in daylight through cuminol reviously dried over chloride of calcium, is absorbed with evolution

of hydrochloric acid. The liquid becomes heated, turns red, and is then gradually decolorised, and after a few hours becomes saturated with chlorine, whereupon the excess of chlorine and the hydrochloric acid are expelled by a stream of carbonic acid, and the product is kept so as to preserve it from air and moisture.

Properties. Yellowish liquid, heavier than water. It has a very powerful odour, differing from that of cuminol.

				Gerh	ardt & Caho average.	urs.
20 C	120	244	65.79		64.64	
11 H	. 11		6.03	*******	6.54	
Cl ,	35.5	****	19.41	*******	22.18	
20	. 16	****	8.77	Accession	6.64	
C20H11ClO2	182.5		100.00		100.00	

Isomeric with chloride of cumyl.

According to Gerhardt & Cahours, it had absorbed hydrochloric acid, and consequently gave too little C, and too much H and Cl.

Decompositions. 1. Decomposed by moist air into hydrochloric and cuminic acids. It does not keep well, even in stoppered bottles, but turns red, becomes turbid, and evolves fumes of hydrochloric acid; perhaps a spontaneous decomposition takes place without the intervention of moist air. — 2. It is decomposed by distillation into hydrochloric acid, carbon, and a peculiar volatile oil. — 3. It dissolves completely in a few moments in boiling aqueous potash, as chloride of potassium and cuminate of potash. — 4. Strong sulphuric acid dissolves chlorocuminol with evolution of hydrochloric acid, forming a crimson solution which in contact with moist air soon deposits crystals of cuminic acid. — 5. When dry gaseous ammonia is passed through chlorocuminol, it becomes thick and stops up the tube; if the chlorocuminol is dissolved in absolute alcohol, a large quantity of chloride of ammonium is immediately deposited, and on adding water to the decanted liquid, a chlorinated oil is precipitated, which with potash yields cuminic acid, and when heated by itself, hydrochloric acid, charcoal, and a peculiar volatile oil. Hence ammonia appears merely to combine with the hydrochloric acid formed by the slow decomposition of the chlorocuminol, and not to act on the compound itself. — 6. It does not yield cuminate of ethyl with absolute alcohol.

Chlorine-nucleus C20Cl2H10.

Chloronicene.

C20Cl2H10.

St. Evre. (1849.) N. Ann. Chim. Phys. 25, 495; also Ann. Pharm. 70, 263; also J. pr. Chem. 46, 458.

Nicène monochloré.

Formation and Preparation. By distilling chloroniceic acid (C12ClH2O4, xi, 176) with excess of lime or baryta:

 $2C^{12}C1H^5O^4 = C^{20}Cl^2H^{10} + 4CO^2$.

Chloronicene then passes over first, as a brown-yellow liquid, then paranicene, C¹⁰H⁶ or C²⁰H¹², in yellow crystals.

Impure chloronicëic acid may be used for the preparation, in which case the distillate will contain benzene, C¹²H². This may be distilled of at 90° in a stream of carbonic acid or hydrogen (air would decompose it), and if the receiver be then changed, chloronicene may be collected between 290° and 295°, and there remains a liquid mixture of chloronicene and a solid hydrocarbon which solidifies on cooling.

Properties. Pale yellow oil, of sp. gr. 1.141 at 10°, boiling between 292° and 294°, and having a vapour-density of 7.52. In vessels containing air, it turns brown after some weeks.

			St. Evre.		Vol.	Density.
2 Cl	70.8	. 59·76 . 35·26 . 4·98	. 34.69	C-vapour Cl-gas H-gas	. 2	4-9006
CacClaH 10	200.8	. 100.00	100-92	Vapour	2	13-9216

Thus according to Laurent & Gerhardt. (Compt. chim. 1849, 163). According to St. Evre, the atomic weight is only half as great. Gerhardt afterwards regarded it as identical with chloride of phenyl, Cl²H^aCl (see page 142).

Fuming nitric acid attacks the compound with violence, converting it into nitrochloronicene and a resin.

Oxybromine-nucleus CoBroH2O2.

Brom-sassafras Oil.

 $C^{20}H^{2}Br^{6}O^{4} = C^{20}H^{2}Br^{6}O^{2},O^{2}.$

St. Evrs. (1846.) N. Ann. Chim. Phys. 12, 107; also J. pr. Chem. 34, 372; abstr. Compt. rend. 18, 735; N. J. Pharm. 10, 314.

Formation and Preparation. When bromine is slowly dropped into sussafras oil, a large quantity of hydrobromic acid is evolved, and the oil becomes crystalline. The crystalline mass is pressed between paper, washed with the smallest possible quantity of ether, which separates free bromine and a fibrous substance resembling solid chloride of carbon, and dried in vacuo at 130°.

Properties. White needles united in tufts.

				St. Evre.
20 C	120	.	15.12	 14.64
2 H	2		0.25	 0.22
8 Br	640		80.60	 79.81
40	32		4.03	 5.27
CaillaBraO4	794		100.00	 100:00

Decompositions. 1. By chlorine in sunshine, it is converted into a tough mass, free from hydrogen and resembling sesquichloride of carbon—2. Heated with aqueous potash, it yields a brittle translucent resin still containing bromine.

It dissolves in boiling ether.

Oxychlorine-nucleus C20Cl9HO2.

Chlor-sassafras Oil.

 $C^{20}HCl^{9}O^{4} = C^{20}Cl^{9}HO^{2},O^{2}.$

St. Evre. (1846.) N. Ann. Chim. Phys. 12, 107; also J. pr. Chem. 34, 372; abstr. Compt. rend. 18, 735; N. J. Pharm. 10, 314.

Formation and Preparation. By distilling in the oil-bath a mixture of sassafras oil and pentachloride of phosphorus, washing the oily distillate with water to remove oxychloride of phosphorus and hydrochloric acid, and rectifying it over oxide of lead in a stream of carbonic acid.

Properties. Boils at 238°.

Nitro-nucleus C20XH11.

Nitroparanicene.

 $C^{20}NH^{11}O^4 = C^{20}XH^{11}$.

Paranicène nitrogéne. (Compare page 142.)

Formation and Preparation (p. 142.) Paranicene is dissolved in fuming nitric acid, and the needles which separate on cooling are freed from resin by recrystallisation from alcohol and other.

C20XH11	177		100.00		100.00
4 0	32	••••	18.09	•••••	18.38
11 H					
N	14	****	7.91	*******	8.12
20 C					
			•		mean.
					St. Evre

Hydrosulphate of Ammonia converts it into paranicene (St. Evre, N. Ann. Chim. Phys. 25, 506.)

Nitrocuminic Acid.

C20NH11O8=C20XH11,O4.

CAHOURS. (1848.) Compt. rend. 24, 554; N. Ann. Chim. Phys. 25, 36; J. pr. Chem. 46, 346; Ann. Pharm. 69, 243.—N. Ann. Chim. Phys. 53, 334; Ann. Pharm. 109, 18.

First observed in 1841, by Gerhardt & Cahours (N. Ann. Chim. Phys. 1, 69.)

Formation. By the action of fuming nitric acid on cuminic acid. (Cahours.) — 2. If a solution of cuminic acid in cold nitro-sulphuric acid be mixed with water, nitro-cuminic acid separates from it after a short time. (Kraut, N. Br. Arch. 96, 274.)

Preparation. Cuminic acid is dissolved in warm concentrated nitric acid; the solution is heated to the boiling point, whereupon red vapours are evolved, but no violent action takes place; and after boiling for some minutes, it is precipitated with water. It then deposits a yellow, heavy, quickly solidifying oil, which must be washed two or three times with water and recrystallised from alcohol.

Properties. Yellowish white crystalline scales.

						Cahours.
20 C		120		57.41	*******	57.33
N	***************************************	14	****	6.69		6.79
11 H		11		5.26	*******	5.37
80	************************	64	****	30.64	******	30.51
CONT	diiOt	900		100.00		100.00

Decompositions. 1. On treating the ammonia-salt with sulphuretted hydrogen (Cahours), or with iron-filings and acetic acid, (Boullay, Compt. rend. 43, 399), it is converted into amidocuminic acid. — 2. It is not altered by boiling with chromate of potash and sulphuric acid. (Hofmann, Ann. Pharm. 97, 206.)

Combinations. The acid is insoluble in water. It dissolves very readily in ammonia, potash and soda, forming crystallisable salts.

Nitrocuminate of Lime. Yellow needles grouped in stars. Becomes darker coloured by exposure to light. When dried at 100°, it contains 8.54 p. c. calcium, and is therefore C²⁰CaXH¹⁰O⁴ (calculation 8.77 p. c. Ca.) (Kraut, N. Br. Arch. 96, 274.)

Nitrocuminate of Silver. Obtained from the ammonia-salt by double decomposition. Beautifully white. Contains after drying in vacuo, 34.0 p. c. Ag. (C20AgXH10O4 = 34.17 p. c. Ag.)

Nitrocuminic acid dissolves readily in alcohol and ether.

Nitro-nucleus C20X2H10.

Binitrocuminic Acid.

 $C^{20}H^{10}N^2O^{12} = C^{20}X^2H^{10}O^4$

Cahours. (1849.) N. Ann. Chim. Phys. 25, 36; J. pr. Chem. 46, 346;

Ann. Pharm. 69, 243.

Boulley. Compt. rend. 43, 309; Chem. Centr. 1856, 782.

Kraut. N. Br. Arch. 96, 274; Chem. Centr. 1859, 85.

Formation and Preparation. Fused cuminic acid dissolves without evolution of gas in nitrosulphuric acid; and the solution on being heated to the boiling point, gives off red vapours, becomes turbid, and soon deposits crystalline laminæ, which may be washed with water and recrystallised from alcohol. (Cahours.) The solution of cuminic acid in nitrosulphuric acid is precipitated with water, after standing for 24 hours at a medium temperature; the precipitated brown powder is washed with water, and boiled with milk of lime; and the filtered solution is mixed with hydrochloric acid, which precipitates binitrocuminic acid, - to be purified by washing with water and recrystallisation from alcohol. (Kraut.)

Properties. Laminæ having a strong lustre. (Cahours.) Light yellow crystals of the doubly oblique prismatic system. Henhenohedrons (Fig. 121.) with the angles $u: y = 83^{\circ} 32^{\circ}1'$; $y: v = 82^{\circ} 50'$; $u: v = 87^{\circ} 4^{\circ}5'$. The acute edge y v, is truncated by a dodecahedral face inclined to y at 118° 2.9′, and to v at 154° 47.1′; there is also to the left in front an octohedral face making with u an angle of 133° 2.1′, and to the left behind an octohedral face making with u an angle of 133° 4.2′. Disregarding the slight inequality of these last two angles, the face u, the two octohedral faces, and the dodecahedral face form together a rhombic prism with perpendicularly truncated edges, the faces y and v resting upon it in a doubly oblique direction. Cleavage parallel to u. (v. Dauber.)

Becomes darker in colour by exposure to light. (Kraut.)

						Cahours		Kraut.
200		644		ances.		mean.		mean.
20 C		120	****	47.24	ment	47.27	****	47.31
2 N		28		11.02	*******	10.83		
10 H	*****************	10		3.93	****	3.99	via	4.45
120	***************************************	96	****	37.81	********	37.91		

Decompositions. 1. Not acted upon by fuming nitric acid, even at the boiling heat. (Cahours.)—2. Treated with iron filings and acetic acid, it forms biamidocuminic acid. (Boullet.)

Combinations. According to Cahours, binitricuminic acid does not possess acid properties, being neither dissolved nor decomposed by warm ammonia, potash or soda-ley. According to Kraut, on the contrary, it does behave like an acid, and forms salts which acquire a darker yellowish red colour by exposure to light.

Binitrocuminate of Baryta. Obtained by dissolving the acid in baryta-water, precipitating the excess of baryta with carbonic acid boiling, and evaporating the filtered solution. It first separates in films which become crystalline under the mother-liquor. After drying over oil of vitriol, it does not diminish in weight at 120°. It contains 20.48 p. c. Ba. and is therefore CoBaX2HO. (Calculation = 21.30 Ba.) (Kraut.)

Binitrocuminate of Lime. - Prepared like the baryta-salt. Yellowish red crystalline needles, which dissolve easily in water, with deep wine red colour, do not diminish in weight at 120° after drying over oil of vitriol, and contain 7.01 p. c. Ca.; therefore = C20CaX2HOO4 (calculation = 7.33 Ca.) (Kraut.)

Binitrocuminate of Silver. — Obtained by precipitating the aqueous solution of the lime-salt with nitrate of silver, and recrystallising from hot water. Light yellow needles, which are scarcely altered by exposure to light. After drying over oil of vitriol, they give off 5-26 p. c. water at 100° (2 At. = 4.74 p. c.): and then contain 29-76 p. c. Ag. (C³⁰AgX²H⁹O⁴ = 29-91 p. c.) (Kraut.)

Binitrocuminic acid is soluble in alcohol, and easily soluble in ether.

Binitrocuminate of Ethyl.

 $C^{24}N^{2}H^{14}O^{12} = C^{4}H^{5}O_{*}C^{20}X^{2}H^{9}O^{3}$

KRAUT. N. Br. Arch. 96, 278.

Obtained by repeatedly passing hydrochloric acid into alcoholic binitrocuminic acid and precipitating by water, and purified by treatment with carbonate of soda, washing with water, and recrystallisation from alcohol.

Colourless, aggregated needles. Melts at 77.5°

24 C			 50.44	
	14	 9-93 4-97 34-03	 5-56	
C4H5O.C20X2H9O3	282	 100-00		

Ammonia converts it into binitrocuminamide, which crystallises in thick yellow prisms soluble in alcohol. - Treated with iron filings and acetic acid, it forms biamidocuminate of ethyl. (Boullet, Compt. rend.

Binitrocuminic ether is soluble in alcohol.

Nitrochlorine-nucleus C20X2Cl2H8.

Nitrochloronicene. $C^{10}N^{2}Cl^{1}H^{8}O^{8} = C^{10}X^{2}Cl^{2}H^{8}$.

St. Evre. N. Ann. Chim. Phys. 25, 495; J. pr. Chem. 46, 458; Aug. Pharm. 70, 263.

Nitronicène monachloré = C"XCIH1 (St. Evre). See page 142.

Formation and Preparation. (comp. p. 167.) Chloronicene is treated ith fuming nitric acid, and the resulting mass is dissolved in alsolution

of 36°. The less soluble resin is then first deposited, and afterwards nitrochloronicene crystallises out, which may be further purified by recrystallisation from alcohol.

Long, amber-yellow, silky needles.

					St. Evre.
20 C	120.0	****	41.26		40.92
2 N	28.0	****	9.63	*******	8.62
2 Cl	70.8	****	24.34		24.09
8 II	8.0	****	2.75		2.83
80	64.0	****	22.02		23.54
C20X2Cl2H8	290.8	,,,,	100.00		100.00

An alcoholic solution of hydrosulphate of ammonia turns it brown, then dark violet, and yields chloronicin, with deposition of sulphur. Soluble in alcohol and in ether.

Amidogen-nucleus C20 AdH11.

Cuminamide.

 $C^{20}NH^{13}O^2 = C^{20}AdH^{11},O^2.$

F. Field. (1847.) Ann. Pharm. 65, 45; Mem. Chem. Soc. 3, 404; Phil. Mag. J. 31, 459; J. pr. Chem. 44, 136.

Gerhardt. Ann. Pharm. 87, 79.

Gerhardt & Chiozza. Ann. Pharm. 87, 299; N. Ann. Chim. Phys.

46, 135.

Formation. 1. By heating cuminate of ammonia. (Field.) — 2. By the action of ammonia on cuminate of ethyl. (Dumas, N. Ann. Chim. Phys. 23, 349.) — 3. By the action of dry ammonia gas (Cahours, N. Ann. Chim. Phys. 23, 249), or of carbonate of ammonia (Gerhardt & Chiozza) on chlorocumyl. — 4. Cuminic anhydride is gradually converted into cuminamide by the action of aqueous ammonia. — Benzo-cuminic anhydride is converted by ammonia into a mixture of benzamide or benzoate of ammonia and cuminamide, to be separated by aqueous ammonia, which dissolves chiefly the benzamide. (Gerhardt.) — 5. Cumonitrile is slowly converted into cuminamide by alcoholic ammonia. (Field.)

Preparation. 1. Chloride of cumyl is triturated in a mortar with carbonate of ammonia, and the mixture gently heated; whereupon carbonic acid is evolved, and cuminamide is produced, to be separated from sal-ammoniac and excess of carbonate of ammonia by washing with water. (Gerhardt & Chiozza.) — 2. When cuminate of ammonia is heated in a scaled tube in the oil-bath to the boiling point of the oil, or continuously heated in a retort to incipient fusion, cuminamide is produced, and may be purified by recrystallisation from boiling dilute aqueous ammonia. (Field.)

Properties. Crystallises by rapid separation from its concentrated aqueous solution, in tables; by slow separation from a dilute solution, in long opaque necdles. (Field.)

					Field.		Gerhardt.
20 C	. 120	****	73.68		73-66		73.28
N	. 14	****	8:52	*******	8.50		
13 H	. 13	****	7.99	*******	8.13	****	8.00
20	. 16	****	9.81	*******	9.71		
C ²⁰ NH ¹³ O ²	. 163		100.00		100.00		

Field's cuminamide was obtained by formation 1 and 5; Gerhardt's by 4.

Decomposition. Cuminamide withstands the action of strong acids and alkalis more obstinately than other amides, and is converted by them into ammonia and cuminic acid, only after very long boiling. From solution in aqueous potash, it crystallises in large tables. (Field.) — When fused with potassium it does not form cyanide of potassium. (Dumas, Malaguti & Leblanc, Compt. rend. 25, 600.)

*Combinations. Cuminamide is insoluble in cold, but soluble in hot water. (Field.) It is insoluble in cold ammonia (Field), very sparingly soluble in boiling ammonia. (Gerhardt.) It dissolves in all proportions in alcohol and in ether, whether cold or hot. (Field.)

Amidocuminic Acid.

 $C^{20}NH^{13}O^4 = C^{20}AdH^{11},O^4$.

CAHOURS. Compt. rend. 44, 567; Ann. Pharm. 103, 87; J. pr. Chem. 72, 112.—Compt. rend. 46, 1044; Ann. Pharm. 107, 147; J. pr. Chem. 74, 223.—In detail: N. Ann. Chim. Phys. 53, 322; Ann. Pharm. 109, 10; abstr. Rep. Chim. pure. 1, 29.

Cuminamic acid, Cuminaminsaüre.

Formation and Preparation. Nitrocuminate of ammonia is reduced by excess of hydrosulphuric acid; the liquid is evaporated at a gentle heat till all the ammonia is expelled and the excess of sulphur is separated; the concentrated solution is precipitated by a slight excess of acetic acid; and the resulting precipitate is collected, washed, dried, and recrystallised from alcohol. (Cahours.) — It is also obtained by treating nitrocuminic acid with iron filings and acetic acid (a brisk action then taking place attended with rise of temperature, after which the mixture must be heated for a while in the water-bath); digesting the mixture with aqueous carbonate of soda; filtering; neutralising the excess of carbonate of soda with acetic acid; precipitating with acetate of lead; and decomposing the precipitate with hydrosulphuric acid. (Boullet, Compt. rend. 43, 392.)

Properties. Colourless or light yellow crystals. By spontaneous evaporation of the solutions, it is obtained in tables.

	20 C			67-04	*******	Cahours.	
	13 H	13	****		-	7-13	
1000	C=NH"O1	179		100-00	10		Ī

Decompositions. 1. In solution in nitric acid, it is converted by nitric oxide gas into oxycuminic acid.—2. By treating alcoholic amidocuminic acid with nitrous acid, light yellow needles are obtained, consisting of a new bibasic acid = C⁶⁰N³H²³O⁸ (P. Griess, Compt. rend. 49.80);

$$2 C^{20}NH^{13}O^4 + NO^3 = 3 HO + C^{40}N^3H^{23}O^5$$

3. Distilled with caustic baryta or lumps of potash, it yields an alkaline carbonate together with cumidine.

Combinations. Dissolves sparingly in cold, much more freely in boiling water.

Amidocuminic acid unites with acids, forming crystalline salts. It unites also with bases. (Boullet, Compt. rend. 43, 399.)

Sulphate of Amidocuminic acid. — Amidocuminic acid is mixed in slight excess with oil of vitriol diluted with an equal bulk of water, and the mixture is dissolved in warm alcohol. On cooling, thin, white, silky needles are deposited. The compound has a slightly sweet taste, dissolves sparingly in cold, easily in hot water.

				Cahours.
20 C	120		52.64	 53.01
N	14	••••	6.14	
14 H	14	••••	6.14	 6.22
5 O	40	••••	17.54	
80³	40	••••	17.54	 17.28
C20NH13O4,HO,SO3	228		100.00	

Hydrochlorate of Amidocuminic acid. — Amidocuminic acid dissolves slightly in boiling hydrochloric acid, and the solution on cooling deposits thin needles. The compound may also be prepared by adding alcohol to a mixture of amidocuminic acid and hydrochloric acid, whereby a considerable quantity of amidocuminic acid is dissolved, and evaporating. Delicate shining prisms, which dissolve in water, and are partly precipitated on addition of hydrochloric acid.

20 C	120.0				
	1200	••••	55.68	******	55.56
N	14.0		6.49		
14 H	14.0		6.49		6.56
Cl	35.5		16.47		16.28
4 0	32.0		14.87		

Nitrate of Amidocuminic acid forms beautiful prisms.

Chloroplatinate of Amidocuminic acid. — Obtained by adding alcohol to the mixed solutions of concentrated bichloride of platinum and hydrochlorate of amidocuminic acid, warming the mixture till it dissolves, then filtering and leaving the solution to evaporate.

Long reddish needles.

MIDOGEN-NUCLEUS CMACHIO.

					(Cahours.
		120.0	****	31.21		31-00
_		14.0	****	3.64		3.79
		106.5	***	27.69		
	***	98-0	****	25.48		25.52
		32-0		8:34		
S - 1, 11 *	HI. MICH	384-5		100-00		

and histories in alcohol and in other more readily that

arting uninate of Ethyl.

~```!~``;~ ``\\\\™O`.

The purity reducing an alcoholic solu-

rine i with the phate of ammonia, or with the line in mid. 43, 399.) — On size a sure leavy oil, which may be and the second section with water.

28 (1.05 **NB-0**5 11, 27 11, 1.65%)

Cahours.

... . **69**·36

By a new and, it is slowly converted into an ambie, probably homoloyears in acceptance. It dissolves in the parties, hydrodromic, hydro-

Analysis ales CAFRI.

Biamidocuminic Acid.

 $C^{2}N^{2}H^{14}O^{4} = C^{2}Ad^{2}H^{13},O^{4}.$

W. LLST. (1856.) Court. rend. 43, 399; Chem. Centr. 1856, 782.

od from binitrecuminic acid by the action of iron filings and in the same manner as amidocuminic acid from nitrocumine

Rice. Combines with bases.

Conjugated Amides of the Cuminic series.

Cumanilide.

 $C^{s_0}NH^{17}O^s \ = \ C^{s_0}(NH.C^{12}H^s)H^{11}O^s \ \text{or} \ C^{12}(NH.C^{s_0}H^{11}O^s)H^s.$

Cahours. (1848.) N. Ann. Chim. Phys. 23, 349; J. pr. Chem. 45. 129; abetr. Ann. Pharm. 70, 46.

Phenyl-cuminamide.

Chloride of cumyl becomes heated in contact with aniline, and yields a product, which, after washing with aqueous potash and recrystallisation from alcohol, forms silky needles resembling benzoic acid.

				•	Cahours.
32 C	192		80.28		80.33
N					
17 H	17	****	7.11	******	7.07
2 O					
C22NH17O2	239		100.00		

When treated with phosphoric anhydride, it does not yield cumanilatrile. (Cahours, Ann. Pharm. 74, 40.)
It dissolves sparingly in alcohol.

Cumyl-sulphophenylamide.

 $C^{32}NH^{17}S^{2}O^{6} = C^{12}(NH.C^{20}H^{11}O^{2})H^{6}S^{2}O^{4}$.

GERHARDT & CHIOZZA. (1856.) N. Ann. Chim. Phys. 46, 151.

Azoture de sulfophényle et d'hydrogène.

Preparation. Sulphophenylamide is treated with chloride of cumyl in the oil-bath at a constant temperature; it is then rapidly attacked, and on cooling solidifies to an amorphous glassy mass, which may be crystallised from alcohol. If the temperature were allowed to rise too high, canonitrile and sulphocarbolic acid would be produced.

Properties. Rectangular prisms, with shining, well-developed terminal faces. Melts at 161°.

				Gerhar	dt & Cl	niozza.
32 C	192	••••	63.4		63.3	
N	14		4.6		4.7	
17 H	17		5.6		5.7	
2 S	32	••••	10.5			
6 O	48	••••	15.9			
C22NH17S2O6	303		100.0			

When quickly kented in a test-tube, it yields cumonitrile. — Treated in a slightly ammoniacal solution with nitrate of silver, it yields cumyl-sulphophenylargentamide, and in presence of a larger quantity of ammonia, a sticky mass, probably amidocumylsulphophenate of silver.

monia, a sticky mass, probably amidocumylsulphophenate of silver.

It does not dissolve in boiling water. It dissolves readily in warm aqueous ammonia; also in cold, and still more in hot alcohol.

Cumyl-sulphophenylargentamide.

 $C^{aa}NH^{ba}A_{a}S^{a}O^{a} = C^{aa}(N.Ag.C^{ao}H^{11}O^{a})H^{a}S^{a}O^{a}.$

GERHARDT & CHICERA. (1854.) Compt. rend. 38, 457; Ann. Phorn. 90, 107; fully, N. Ann. Chim. Phys. 46, 153.

Amere de sufriphingle, de cumple et d'argent.

Preparation. Cumyl-sulphophenylamide suspended in boiling water is dissolved by addition of a few drops of ammonia, and the solution's precipitated by nitrate of silver.

Properties Very light, slender needles.

			Gerhardt & Chiosz				
22 C	192		46-8	********	46.4		
S	14	•	3.4	1001 0000	3.5		
16 H	16		3-9	*******	3-9		
٠ عد			26.3				
2 S	. 32		7.3				
60	43	••••	11-8				
CXNRTUS	(4)! 410		100.0			_	

It decomposes quietly when leaded, giving off cumonitrile.—It is solved readily in manual, and the solution when evaporated yield cumyl-sulphophenyl-argent-brain-biamide.

Scarcely soluble in beiling source.

Cumyl-sulphophenyl-argent-hydrobiamide.

 $C^{\alpha}N^{\alpha}H^{\alpha}S^{\alpha}V = C^{\alpha}/N.A_{S}C^{\alpha}H^{\alpha}O^{\alpha}/H^{\alpha}S^{\alpha}O^{\alpha} + NH^{\alpha}.$

Germandt & Chiozza. (1854.) Compt. rend. 38, 457; Ann. Photo. 90, 107; J. pr. Chon. 62, 49. — In detail, N. Ann. Chim. Phys. 48, 154.

Practiture de suffigilangie, de comple, d'argent, et d'hydrogène.

Proportion. By dissolving cumyl-sulphophenylargentamide in ammonia, and leaving the solution to evaporate. If evaporated by book it yith an oil.

Properties. Nacrous needles, grouped like a fan.

				Gerhardt & Chiozza		
32 C		1664	45.0		45.0	
2 N	-	****	6.5	Accessed	6.2	
19 H		ini	4.5	*******	4.7	
Ag	108		25.3			
2 S	32	****	7.5			
6 O	48	-	11.2	4		
C22N2H19A~S2O6	407		100.0			

By continued boiling with water, it gives off a little ammonia. Dissolves very sparingly in boiling water. Soluble in alcohol.

Cumyl-benzoyl-sulphophenylamide. $C^{46}NH^{21}S^{2}O^{8} = C^{12}(N.C^{20}H^{11}O^{2}.C^{14}H^{6}O^{2})H^{6}S^{2}O^{4}.$

GERHARDT & CHIOZZA. (1853.) Compt. rend. 37, 86; Ann. Pharm. 87, 302. — In detail, N. Ann. Chim. Phys. 46, 149.

Azoture de sulfophényle, de benzoile et de cumyle.

Produced by the action of chloride of cumyl on benzoyl-sulphophenylargentamide, and obtained in confused prisms by dissolving the product in boiling ether and evaporating the ether.

Scarcely soluble in water. Dissolves with difficulty in ammonia; the solution is precipitated by acids and by the salts of lead and silver.

Dissolves in alcohol more readily than benzoyl-salicylamide. Sparingly soluble in ether.

Cumyl-salicylamide. $C^{34}NH^{17}O^{6} = C^{20}(N,C^{14}H^{6}O^{4})H^{11}O^{2}$?

Gerhardt & Chiozza. (1853.) Compt. rend. 37, 86; Ann. Pharm. 87, 301; J. pr. Chem. 60, 144. — In detail, N. Ann. Chem. Phys. 46,

Azoture de salicyle, de cumyle et d'hydrogène.

Obtained by the action of chloride of cumyl on salicylamide (xii. 321), in a similar manner to benzoyl-salicylamide.

Properties. Very light, shining needles. Melts at about 200°, becomes pasty at a stronger heat, and remains so on cooling.

						Gerh	ardt & Chiozza
							mean.
	34 C	***************************************	204	****	72.0		71.85
	N	******************	14	****	4.9	******	5.10
	17 H	***************************************	17		6.0		6.10
	60		48	in	17.1		16.95
Ī	CMNE	1706	283		100.0		100.00

Azo-nucleus C20NH11.

Cumonitrile C'NH".

Fr. Field. (1847.) Ann. Pharm. 65, 51; Mem. Chem. Soc. 3, 408; J. pr. Chem. 44, 136; Phil. Mag. J. 31, 459.

Formation. 1. By the dry distillation of cuminate of ammonia, cuminamide being formed at the same time. - 2. By the action of bromide of cyanogen on cuminate of potash, carbonic acid being likewise evolved. (Cahours, N. Ann. Chim. Phys. 52, 201; Ann. Pharm. 108, 320,

3. By the action of heat on cumyl-sulphophenylamide and on cumyl-sulphophenylargentamide. If, in the preparation of cumyl-sulphophenylamide, the mixture of chloride of cumyl and sulphophenylamide be too strongly heated, cumonitrile and sulphocarbolic acid are produced. (Gerhardt & Chiozza, N. Ann. Chim Phys.

Preparation. Cuminate of ammonia is heated in a retort to complete fusion and then maintained in violent ebullition, whereupon large drops of cumonitrile pass over together with water. As soon as the oil has completely passed over, it is separated with a pipette from the distillate, and the watery liquid is poured back into the cooled retort, and redistilled five or six times. The whole of the oil thus obtained is freed by washing with ammonia from traces of cuminic acid dissolved in the oil; it is then washed successively with hydrochloric acid and water, dried by leaving it for some days over chloride of calcium, and rectified. The portion which goes over last may contain water.

Transparent, colourless oil of sp. gr. 0-765 at 14. Refracts light strongly. Boils constantly from platinum wire at 239, under pressure of 0.7585 met. Has a very strong, but agreeable odour, and a burning taste.

Decompositions. 1. The vapour of cumonitrile is inflammable and burns with a brilliant flame. - 2. Cumonitrile is but slightly altered by strong nitric acid in the cold, but on boiling, cuminic or nitrocumine acid is produced. — 3. Heated with potassium, it becomes darker and forms a large quantity of cyanide of potassium. - 4. Alcoholic potas does not alter it immediately, but converts it, after a few days, into a crystalline pulp consisting of the oil turned yellow and cuminamide.

Cumonitrile dissolves but slightly in water, and renders it milky.

Paranicine.

$C^{so}NH^{1s} = C^{so}NH^{11},H^{s}$

St. EVRE. N. Ann. Chim. Phys. 25, 506; Ann. Pharm. 70, 266; J. pr. Chem. 46, 468.

Compare page 142.

Formation and Preparation (comp. p. 169.) Sulphuretted hydrogen is passed through alcoholic solution of nitroparanicine saturated with ammonia; the liquid is evaporated; the residue is dissolved in weak hydrochloric acid; and the filtrate is left to crystallise, whereupon octohedrons of hydrochlorate of paranicine separate out. From this salt ammonia precipitates paranicine in pale yellow flocks.

					St. Evre.	
20 <u>C</u>					81.34	
N		****			y·51	
 13 H	18	****	8.84	•••••	8.82	
CMNH18	147		100:00		00.67	

If paranicine be dissolved in ether immediately after precipitation, and the ether then evaporated, there remains an amber-coloured oil, which dissolves in hydrochloric acid, and is precipitated by ammonia in snow-white flocks. These flocks dissolve in cold ether, and on evaporating remain as a solid mass, without passing through the liquid state.

Paranicine is insoluble in water.

Its solutions in dilute nitric, acetic and oxalic acids, yield crystallisshle salts soluble in water.

Hydrochlorate of Paranicine. Octohedrons which redden litmus. Decomposes readily by contact with the air. Insoluble in cold water.

C1						_
14 H					7.73	
N	14.0		7.65	******	7.86	
20 C	120.0	••••	65.57	••••••	65.59	
					St. Evre.	

Chloroplatinate of Paranicine. Obtained by precipitating the hydrochlorate with bichloride of platinum. Crystalline precipitate which becomes liquid after a while, and is altered by light and air.

					St. Evre.	
20 C	120.0	••••	34.00		33.71	
N	14.0	••••	3.97			
14 H	14.0	••••	3.97		4.31	
Pt	98.7	••••	27.96	*******	27.77	
3 Cl	106.2	••••	30.10		29.00	
C*NH13,HCl,PtCl2	352.9		100.00			

Paranicine is soluble in acetic acid and in ether.

Time more

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For The entering the arrangement of the last this material. Leavest & Gerbark southers to common the common to the common to the common terms of t

Deminisch eine 1. The event of dyfinoidische of chloronicise generaliset, who ammont a substance an alice to reaction after a while from the day event. The event of the range to the other leaves on emphasion a take of vir. When they was completely in cold hydroch, no and forming the ratios from which ammonta throws down parabletic (p. 181).

Hydrocher to if the rest. Light veilow, slender prisms, generally on the surface when exystem to the air.— Its concentrated solution mixed with a few drops of anymous supposition time hydrothered and deposits chlorosides in brown focks. Dissolves very easily even in cold water.

					St. Evre
20 C	120-0		39.52	•	
2 N	24.0		9.22	•••••	9-91
4 C1	141.6	•	46.62		45-52
14 H					

wide of mercury precipitates hydrochlorate of chloronicine.

Chloroplatinate of Chloronicine. Prepared by mixing aqueous hydrochlorate of chloronicine with bichloride of platinum, evaporating, and washing the deep yellow granular precipitate with ether.

					St. Evre.
20 C	120.0		18.67		18.83
2 N	28.0		4.35		5.38
8 Cl	283.2	****	44-07		43.64
14 H	14.0		2.18	********	1.93
2 Pt	197.4	****	30.73		30.22
C20N2Cl2H12,2HCl,2PtCl2	642.6	-	100.00		100.00

Acetate of Chloronicine. Chloronicine recently prepared and dried in vacuo, is dissolved in dilute acetic acid, and the solution is evaporated in vacuo.

Pale yellow, four-sided prisms, easily decomposible by light and air. Has an acid reaction, even after repeated recrystallisation.

					St. Evre.
28 C	168.0		47.88		47.56
2 N	28.0	2.00	7.98		8.41
2 Cl	70.8	****	20.18	*******	19.88
0 H	20.0		5.70		6.32
8 0	64.0		18.26		17.83

Primary Nucleus C20H14.

Cymene. C20H14.

GERHARDT & CAHOURS. (1841.) N. Ann. Chim. Phys. 1, 102; Ann. Pharm. 38, 101. N. Ann. Chim. Phys. 1, 372; Ann. Pharm. 38,

Z. Delalande. (1841.) N. Ann. Chim. Phys. 1, 368; Ann. Pharm. 38, 342.

NOAD. Ann. Pharm. 63, 281; Mem. Chem. Soc. 8, 421; Phil. Mag. J.

32, 15; abstr. J. pr. Chem. 44, 145.

MANSFIELD. Ann. Pharm. 69, 162; Chem. Soc. Qu. J. 1, 244.

KRAUT. Dessertation über Cuminol und Cymen. Göttingen, 1854; abstr. Ann. Pharm. 92, 96; J. pr. Chem. 64, 159; N. Ann. Chim. Phys. 43, 347. CHURCH. N. Phil. Mag. J. 9, 256; J. pr. Chem. 65, 384.—N. Phil.

Mag. J. 13, 415; J. pr. Chem. 72, 125; Ann. Pharm. 104, 111. A. W. HOFMANN. Ann. Pharm. 97, 206; N. Ann. Chim Phys. 52, 104.

Barlow. Ann. Pharm. 98, 245. Haines. Chem. Soc. Qu. J. 8, 289; J. pr. Chem. 68, 430; Chem. Centr. 1856, 593.

LALLEMAND. N. Ann. Chim. Phys. 49, 156; abstr. Ann. Pharm. 102, 119.

SIEVEKING. Dissertation über Cuminol und Cymen. Gött. 1857; abstr. Ann. Pharm. 106, 260.

J. TRAPP. Paresb. Acad. Bull. 16, 296; Ann. Pharm. 108, 386; J. pr. Chem. 74, 428.

Comes. Comes Comes togen. Delalande'. Camphene, Hydride of Thymyl, Thymyl-wassers of.

Sources. In Roman cil of cumin, the volatile oil of Cumissus Cymissus Gerharit & Cahours. For the amount see p. 144.)—In the volatile oil of water-hemlock (Cicuta virosa). (Trapp, p. 145); in the volatile oil of Prych as Afreca according to Haines; but according to Stenhouse, it does not occur in that oil (see Thymol.)—In volatile oil of thyme (Lallemand.) Mixel with thymene, it forms the greater part of that which distills below 180°, and may be obtained by agitation with oil of vitriol, which dissolves the thymene, while cymene floats on the surface (Lallemand).

Foreignish. 1. In the dry distillation of coal, passing over into the lighter, but for the most part into the heavy oil of coal-tar (Mansfeld) — 2. By distilling campher with phosphoric anhydride (Delaland); with chloride of rine (Gerhardt. — 3. In the action of moist carbonic acid gas on oil of turpentine at a low red heat, there is produced, with evolution of carbonic exide, an oil having the composition of cymene (Deville Ann. Cirm. Phys. 75, 68:

$$C^{x}H^{x} + 2CO^{x} = C^{x}H^{x} + 2HO + 2CO$$
.

4. By boiling cuminic alcohol with alcoholic potash (Kraut.) — 5. When purified oil of wormwood is repeatedly distilled over phosphoric anly-dride, and finally over potassium, a compound is obtained similar to or identical with cymene (Leblane, N. Ann. Chim. Phys. 16, 334.) — 6. Oil of wormseed (the volatile oil of the officinal Semen Cyme) does not contain eymene ready formed: but from the cinæbene (CioHi or CicHi) and cinæbene camphor (CioHi O or CicHi) contained in it, cymene is produced, together with other cils, by heating with iodine or with dilute nitrie acid a. By distilling wormseed oil with iodine, agitating the product with potash-ley, then with mercury and lumps of potash, a mixture of cymene, chæbene and cinæbene-camphor is obtained. — b. When wormseed oil is distilled with 2 vols. nitric acid of sp. gr. 1:16, nitrous funnes are evolved and volatile oils pass over. At the same time there is produced a result which, by continued boiling with an additional 2 vols. nitrie acid, is converted into toluylic acid, nitrotoluylic acid and other products. Hence Hirzel supposes that cymene is first formed and immediately undergoes further alteration. (Hirzel, Zeitschr. Pharm. 1854, 23 and 67; 1855, 84 and 181; see also infra. Wormseed-oil.)

Preparation. From Roman Oil of Cumin. — 1. The portion which passes over in fractional distillation below 200° is rectified over causic potash, the whole of the cuminol then remaining behind as cuminate of potash. (Gerhardt & Cahours.) The cymene thus obtained amounts to 41–44 per cent, of the Roman culof comm. No.d. — 2. The cuminol is separated in the manner described at page 145, and the cymene is dried and rectified.— 3. If it be not described to obtain the cuminol, or only as cuminic scid, the Roman oil of cumin may be decomposed with alcoholic potash. Since described at page 149. (Kraut.)

B. From Coal-tar Oil. (See xi, 135, 136.)

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C. From Camphor. Camphor is repeatedly distilled with phosphoric anhydride (Delalande), or better with fused chloride of zinc, a few pieces of chloride of zine being heated in a capacious tubulated retort to incipient fusion, and camphor added by small portions, whereupon the mixture froths up and blackens, and a distillate passes over still containing a large quantity of camphor. This distillate must be purified by repeated rectification over chloride of zinc. This process yields a large quantity of cymene with a comparatively small quantity of chloride of zinc. (Gerhardt, Traité, 3, 608.)

CYMENE.

Properties. Colourless, strongly refracting oil. (Gerhardt & Cahours.) Boils at 170.7° (Church); 171° (Mansfield); 171.5° (Noad); 175° (Gerhardt & Cahours; Delalande; Lallemand); at 177.5°, correction being made for the lower temperatures of the column of mercury in the stem of

made for the lower temperatures of the column of mercury in the stem of the thermometer. (H. Kopp, Ann. Pharm. 94, 319.) Cymene prepared from Roman oil of cumin boils after rectification over sodium at 170.7°, but after treatment with oil of vitriol aided by heat, and separation with water, it boils at 175—176° like the camphor prepared with chloride of zinc. (Church.)

Sp. gr. = 0.845 at 26.7° (Haines); 0.857 at 16° (Noad); 0.860 at 13° (Delalande); 0.860 at 15° and 0.861 at 14° (Gerhardt & Cahours); 0.8678 at 12.6° = 0.8778 at 0°. (Kopp.) — Has an agreeable odour of lemons (Gerhardt & Cahours, Noad); when prepared from camphor it has a different odour (Gerhardt & Cahours) like that of camphor (Noad); but cymene prepared from Roman cumin-oil, if treated with oil of vitriol, and separated but cymene prepared from Roman cumin-oil, if treated with oil of vitriol, and separated by water, smells like that prepared from camphor. (Gerhardt.) Cymene prepared from Ptychotis has a sweetish, smoky odour. (Haines.) Permanent in the air. (Gerhardt & Cahours). Vapour-density = 4.64 (Gerhardt & Cahours); 4.69 (Delalande.)

		Gerhardt & I	Pelalande.	Leblanc.	Kraut.	Haines.
	120 89·56 14 10·44					
C20H14	134 100.00	99-90	99.13	99.5	99.76	100.53
		Vo	1.	Density.		
	C-vapour	2	0	8.3200		
-	H-gas					
100	Vapour of Cyr	nene	2	9.2902		
	100000000		1	4.6451		

The cymene analysed by Gerhardt & Cahours, was prepared from Roman oil of cumin; Delalande's from camphor; Leblanc's from oil of wormwood; Haines's from oil of Ptychosis; Kraut's from cuminic alcohol.

Decompositions. 1. On passing air for several months through cymene prepared from oil of thyme and contaminated with thymene, it becomes viscid, assumes a dark red colour, and partly disappears; the mixture then yields thymene to aqueous potash. (Lallemand.) — 2. Cold fuming sulphuric acid dissolves cymene with dark red colour, without evolution of sulphurous acid, and forms sulphocymolic acid. (Gerhardt & Cahours; Delalande.) Ordinary oil of vitriol has no action upon cymeue. (Gerhardt & Cahours.) Cymene exposed to the vapour of anhydrous sulphuric acid assumes a red and ultimately a black colour, becomes viscid, and forms with water a slightly coloured

solution of sulphocymolic acid-dark-coloured if the sulphuric acid is in excess or brought into the liquid too quickly -which on standing deposits a thick oil still containing a large quantity of cymene. No product analogous to sulphide of benzene is formed in this reaction. (Sievcking.) - 3. Bromine and chlorine, in presence of water, unite with cymene directly and without evolution of hydrochloric or hydrobromic acid, and form bromide or chloride of cymene and hydrogen. (Sieveking.) Dry chlorine heats cymene, turns it brown and chars it. When cymene is repeatedly subjected to slow distillation in a stream of chlorine, a large quantity of hydrochloric acid is evolved, and finally between 170° and 230°, an oil passes over containing 10.7 per cent. of chlorine, similar to that which is produced by the action of alcoholic potash on chloride of hydrogen and cymene. (Sieveking.) - According to Gerhardt and Cahours, bromine or chlorine eliminates hydrobromic or hydrochloric acid gas, and forms a brominated or chlorinated product, which is decomposed by distillation.—Cymene does not absorb hydrochloric acid gas.—4. Cymene carefully mixed with strongly cooled (fuming?) nitric acid, forms nitrocymene. (Barlow.) Moderately dilute nitric acid does not act upon it at mean temperature, but converts it, at the boiling heat, into a peculiar acid (Gerhardt & Cahours), into toluylic (xiii, 8) and nitro-toluylic acids (xiii, 22.) (Noad.)—5. Nitrosulphuric acid, when strongly cooled, scarcely affects it, but at 50° converts it into an oil, from which after some time binitrocymene separates. (Kraut.) — 6. Cymene is not at all affected by caustic potash. (Gerhardt & Cahours.) — 7. Heated with bichromate of potash and sulphuric acid, it is converted into insolinic acid (xiii, 318.) (Hofmann.) It is violently attacked thereby and converted into an oil which is not altered by caustic potash. (Gerhardt and Cahours. It is not decomposed by continued digestion with chromic acid. (Noad.) — 8. It is not altered by digestion with sulphuric acid and peroxide of manganese. (Noad.) -With permanganic acid, it solidifies to a pulp of hydrated manganic oxide, without formation of a peculiar acid. (Noad.)

Combinations. Insoluble in water. Does not combine with alkaline bisulphites. (Bertagnini, Ann. Pharm. 85, 186.) Dissolves readily in alcohol, ether and fat oils. (Gerhardt & Cahours.)

Appendix to Cymene.

a Cymene. C20H14,

BARLOW. Ann. Pharm. 98, 245.

By treating nitrocymene with a pulp of acetic acid and iron filings. Barlow obtained, besides cymidine, an oil which was insoluble in hydrochloric neid, boiled at 175° after repeated rectification, and contained 89°21 per cent. C and 10°67 H. It had therefore the composition of cymene, but when treated with fuming nitric acid, it yielded nitrocymene lighter than water; hence Barlow distinguishes it as a-cymene.

Caryophyllin.

C20H16O2 = C20H14,2HO3

LODIBERT. (1825.) J. Pharm. 11, 101; N. Tr. 11, 1, 108; abstr.

Kastn. Arch. 5, 463; Repert, 22, 134.
Bonastre. J. Pharm. 11, 103; N. Tr. 11, 1, 112; abstr. Kastn. Arch. 5, 463; Repert. 25, 134; J. Pharm. 13, 519.

CHAZEREAU. J. Pharm. 12, 258.

Dumas. Ann. Chim. Phys. 53, 169; Ann. Pharm. 9, 73; Pogg. 29, 90.
Mylius. J. pr. Chem. 22, 105.
Jahn. Ann. Pharm. 19, 333.
Muspratt. Pharm. J. Trans. 10, 343; Liebig & Kopp's Jahresber. 1850, 510.

Nelkelcampher, Stearoptene of oil of cloves. Discovered by Lodibert & Baget.

Sources. Occurs abundantly in East Indian cloves, in smaller quantity in those from Bourbon, not in those from Cayenne. (Lodibert, Bonastre.) It is not decidedly known whether the camphor which, according to Bizio (Brugn. Giorn. 19, 360), is deposited from oil of cloves in the cold, is identical with caryophyllin.

Preparation. Cloves immersed in cold alcohol are left to stand for about a fortnight till the crystalline deposit of caryophyllin no longer increases; the precipitate is then collected on a filter. (Lodibert.) The resin which adheres to them may be removed by washing with aqueous soda. (Bonastre.) Mylius washes the caryophyllin which separates spontaneously from oil of cloves with cold alcohol, and crystallises it from boiling alcohol. Muspratt exhausts cloves with ether, separates the caryophyllin by water, and purifies it by treatment with ammonia. The product amounts to about 3 per cent. of the cloves. (Bonastre.)

Properties. Spherules composed of radiating, white needles having a silky lustre, somewhat rough to the touch, not phosphorescent when rubbed. (Bonastre.) When heated it melts like a resin (Bonastre) sinters together somewhat at 320°, but does not melt till heated above 330°, forming a glass of faint yellow colour, which on cooling solidifies in crystalline nodules, melts again on renewed and stronger application of heat, and then solidifies on cooling to a mass exhibiting numerous fissures. This glass if again heated, becomes white and turbid, as if from incipient crystallisation, but melts again to a clear liquid, and flies to pieces suddenly on cooling. After stronger heating, it becomes much more easily soluble in alcohol, forming a yellow solution, and being at the same time converted into a bitter astringent substance. (Mylius.) At 280° it begins to volatilise (with an odour of resin according to Bonastre), without colouring or fusion, and may be completely sublimed in an air-bath between 280° and 290° (Mylius); at 285°. (Muspratt.) Tasteless and inodorous. Neutral. (Bonastre.)

			Dumas.	Mylius.
20 C 12	0	78.94	78.13	 78.14
16 H 1	6		10.48	 10.65
20 1	6	10.53	11:39	 11.21
C ²⁰ H ¹⁶ O ² 15	2 1	00-00	100:00	 100:00

Ettling (Liebig, Org. Chem. 338) and Muspratt obtained numbers corresponding to the formula C²⁰H¹⁶O².

Decompositions. Caryophyllin burns with a bright, white fuliginous flame. (Jahn.) - 2. It dissolves in oil of vitriol with rose-colour, changing to blood-red (Bonastre); it assumes with oil of vitriol an orange colour, changing to blood-red, and when heated, to carmine-red, and then to brown with evolution of sulphurous acid. From the cold-prepared solution in oil of vitriol water throws down unaltered caryophyllin; and the portion which has not been dissolved by the oil of vitriol, but converted into a blood-red mass, swells up by contact with water and change to a white, loose, semicrystalline tissue. (Mylius.) — 3. It is not altered by cold nitric acid (or even by the warm acid, according to Mylius); but by the boiling acid it is converted into a resin (with the fuming acid, a slight evolution of nitrous gas takes place), without formation of oxali acid. (Bonastre.)

Combinations. Insoluble in water, even at the boiling heat. (Mylias, Jahn.)

Insoluble in dilute mineral acids. (Mylius.) According to Charerent dissolves in water acidulated with sulphuric acid. Insoluble in ammonia and potash, whether caustic or carbonated. (Mylius.)

Sparingly soluble in aqueous soda, and somewhat more in aqueous potest. (Bonastre.)

Sparingly soluble in strong acetic acid; insoluble in cold, soluble in boiling alcohol; easily soluble in ether; in both these liquids, however, it dissolves less readily, in proportion as it is more free from resin (Bonastre.) The alcoholic solution becomes milky on addition of water. (Jahn.) — Soluble in rectified oil of turpentine, less in rock-oil. (Jahn.)

Conjugated compounds of the Primary-nucleus, CaoH1s.

Sulphocymenic Acid. $C^{20}H^{14}S^{2}O^{6} = C^{20}H^{14}, 2SO^{3}.$

Gerhardt & Cahours. (1841.) N. A. Chem. 23, 355; Ann. Pharm. 38, 101. N. Ann. Chim. Phys. 1, 106; J. p.

Delalande. N. Ann. Chim. Phys. 1, 368; Ann. Pharm. 38, 342.
Church. Phil. Mag. J. 9, 256; J. pr. Chem. 65, 384.
Sieveking. Dissertation über Cuminol und Cymen. Gött. 1857, II; abstr. Ann. Pharm. 106, 257; J. pr. Chem. 74, 505.

Sulphocymolic acid, Acide sulfo-cymenique (Gerhardt & Cahours). Acide sulfo-camphique (Delaland.) Sulfocymylsäure (Sieveking). Acide thymyl-sulfur-su

Formation. (p. 185.) — It appears also to be produced by the action of fuming oil of vitriol on chloride of cymene and hydrogen (see below). (Sieveking.)

Preparation. Cymene is dissolved in a slight excess of fuming alphuric acid (the mixture being cooled, according to Gerhardt & Cahours; beated in the water-bath, according to Delalande); the liquid is diluted with water, satrated with carbonate of lead, and filtered; and the solution of salpho

menate of lead is evaporated to the crystallising point. — The agree tion of the crystals decomposed by sulphuretted hydrogen, and to ted in vacuo after filtration, yields sulphocymenic acid. (Delalinia) As the solution of the lead-salt is apt to decompose during evaporation, and leave a dark-brown mass, the solution of which is not decolorised by sulphuretted hydrogen, Sieveking decomposes the baryta-salt with dilute sulphuric acid, removes the excess of that acid by carbonate of lead, and the dissolved lead by sulphuretted hydrogen, and thus obtains aqueous sulphocymenic acid.

Properties. Small deliquescent crystals. (Delalande.)

Decompositions. 1. With fuming nitric acid, it easily forms nitrosulphocymenic acid, the salts of which detonate when heated. (Church.)—2. The dry baryta-salt brought in contact with pentachloride of phosphorus, yields a yellowish distillate, which, when mixed with water, deposits a heavy brown oil. (Sieveking.)

Combinations. With metallic oxides it forms the sulphocymenates. These salts are all soluble; hence the solution of the baryta-salt does not precipitate metallic salts. (Gerhardt & Cahours.)

Sulphocymenate of Soda. — Obtained by precipitating the solution of sulphocymenate of baryta with an exactly equivalent quantity of carbonate of soda, and evaporating the filtrate over the open fire.

nate of soda, and evaporating the filtrate over the open fire.

Slender needles or laminæ baving a silky lustre. Dissolves very readily in water and alcohol. Contains 5 At. water of crystallisation,

which go off at 170°. (Sieveking.)

				1	Sieveking. mean.
C20H13S2O6	213	****	75.80		
Na	23		8.18	********	8-22
5 HO	45	****	16.02		
C20NaH13S2O6+5Aq	281		100.00		

Sulphocymenate of Baryta. — The solution of cymene in fuming sulphuric acid (gently heated, according to Gerhardt & Cahours) is saturated with carbonate of baryta, and the filtrate is evaporated to the crystallising point.

The crystals heated to 100° (Gerhardt & Cahours), 130° (Trapp),

170° (Sieveking) yield the anhydrous salt.

in the second se	Dry.			Gerh	ardt & Caho	urs.
20 C	120.0		42.61		42.15	
13 H	13.0	****	4.62	*******	4.70	
Ba	68.6	****	24.36		24.10	
28	32.0	****	11.36		11.60	
6 O	48.0		17.05	*******	17.45	
C ²⁰ BaH ¹⁵ S ² O ⁶	281.6	·	100.00	********	100.00	-

The salt prepared with cymene from cicuta-oil, contains 24.75 p. c. Ba (Trapp).

Compounds with Water. Sulphocymenate of baryta crystallises with 2 At. water (Gerhardt & Cahours), 3 At. (Sieveking) with 4 At. (Delalande).

190 CONJUGATED COMPOUNDS OF THE PRIMARY NUCLEUS COMP.

a. Bi-hydrated. — Crystallises by cooling or evaporation in lamine having a strong pearly lustre. (Gerhardt & Cahours.)

				Gerhau	Gerhardt & Cahoun		
20 C	120.0	••••	40.05	*******	39.90		
15 H	15.0	••••	5.02		5.25		
Ba	68.6	••••	22.88				
2 S	32.0	••••	10.66				
8 O	64.0	••••	21.39				
C20BaH13S2O6+2Aq	299.6		100.00			_	

β. Ter-hydrated. — The solution evaporated till a crystalline film forms on its surface and cooled, yields the ter-hydrated salt in pearly lamina having the form of Brookite. (Sieveking.)

						Sieveking
20 C		120.0		38.9		
13 H		13.0	••••	4.2		
Ba	ı	68· 5	••••	22.2	*******	22.30
2 S		32.0		10.4		10.03
6 O.		48.0		15.6		
3 H	O	27.0	••••	8.7		8.67

γ. Tetra-hydrated. — Laminæ obtained by evaporation and recrystallisation.

			1	Delalande.
20 C	120.0	 37.78	*******	35.41
17 H	17.0	 5.35	******	5.57
Ba	68.6	 21.59		
2 S	32.0	 10.07		
10 O	80.0	 25.21		
C20BaH11S2O6+4Aq	317.6	 100.00		

Contains, according to Delalande (in accordance with his incorrect calculation of the tetra-hydrated salt) 26:1 p. c. of baryta, which however would come nearer to the quantity of baryta in the bi-hydrated salt (calculation, 25:5 BaO).

ε. Aqueous Solution. The baryta-salt dissolves readily in wates, alcohol and ether. The aqueous solution decomposes when boiled; the hot-saturated solidifies on cooling. (Gerhardt & Cahours.) Tastes bitter, then disagreeably sweet; saccharine.

Interpolation. Sulphocymenate of Baryta containing the acid CoHBSO.

Gerhardt & Cahours, by neutralising crude sulphocymenic acid, in the cold, with carbonate of baryta, once obtained a confusedly crystalline mass, which dissolved is water much more readily than the ordinary (hot-prepared) salt, and contained 15.73 p. c. barium, whence they regarded it as C**112"BaS^2O^6 (calculation 16.4 Ba) Sieveking did not succeed in preparing this salt.

Sulphocymenate of Lime. Obtained by neutralising crude sulphocymenic acid with marble. Thin colourless laminæ (having the taste of the baryta-salt, according to Delalande), very soluble in water and alcohol. Gives off I At. water (7.97 p. c.) at 150°, then 2 At. more (134 p. c. in all) at 170°, and then contains 7.98 p. c. alcum (C**H**Cas**0**= 8.5 Ca). (Sieveking.)

Sulphocymenate of Lead. — Preparation (p. 188). Pearly lamine which, at 120°, give off 10.3 p. c. water (4 At. = 10.24 p. c.) without further alteration. (Delalande.)

PbO	Laminæ	-	Delalande				
20 C	. 120.0		34.02	*******	33.75		
PbO	. 111.8	****	31.69		31.80		
17 H	. 17.0	****	4.82	********	4.60		
2 S	. 32.0	****	9.07		9.40		
90	. 72.0	****	20.40	*******	20.45		

When prepared with cymene obtained from oil of cicuta, it contains, after drying at 123°, 32°56 p. c. lead (C²⁰H¹³PbS²O⁶ = 32°74), Trapp.

Cupric Sulphocymenate. Obtained by decomposing the baryta-salt with sulphate of copper. Light green lamine with a silky lustre, easily soluble in water and alcohol. (Sieveking.)

Sulphocymenate of Silver. The solution of carbonate of silver in sulphocymenic acid becomes coloured when evaporated in vacuo or over the water-bath, and leaves a brown residue containing a few needleshaped crystals. (Sieveking.)

Oxygen-nucleus C20H12O2.

Anethol or Anise-camphor.

C20H12O2.

GÜNTHER. Alm. 1783, 156.

SAUSSURI. N. Ann. Chim. Phys. 13, 280.

J. Dumas. Ann. Pharm. 6, 253. Blanchet & Sell. Ann. Pharm. 6, 2873 (1)

Cahours. Rev. scient. 1840, 342; J. pr. Chem. 22, 58; in detail, N. Ann. Chim. Phys. 2, 274; J. pr. Chem. 24, 337; Ann. Pharm. 41, 56; Compt. rend. 19, 795; in detail, N. Ann. Chim. Phys. 14, 489; J. pr. Chem. 36, 421.

LAURENT. Compt. rend. 10, 531; 12, 764; Rev. scient. 10, 5 and 376; J. pr. Chem. 27, 232.

Gerhardt. Ann. Chim. Phys. 72, 167; Compt. rend. 15, 498; N. Ann. Chim. Phys. 7, 292; Compt. chim. 1845, 65; J. pr. Chim. 36, 267; abstr. Compt. rend. 20, 1440.

Investigated particularly by Cahours, Laurent and Gerhardt, the last of whom recognised the chemical identity of oil of tarragon with oil of anise and oil of fennel. The chief constituents, chemically similar but physically different, of the oils of anise, staranise, feanel, and tarragon, are here united under the name anethol, which was formerly used provisionally by Gerhardt for anisoïn.

The volatile oils of anise (Pimpinella Anisum), fennel

(Anethum Fæniculum), tarragon (Artemisia Dracunculus), and star-anise (Illicium anisatum), consist almost wholly of anethol; and with the same mode of preparation, the oils of anise, fennel, and star-anise consist in some cases of a solid crystallisable variety of anethol, in other cases of liquid anethol; in the latter case, they generally contain also small quantities of a hydrocarbon isomeric with oil of turpentine. Anethol exists ready formed in the plants, and, according to Mohr, sometimes separates in the form of a flocculent wool, from bruised fennel seeds which have been left to themselves for a long time. (Comment. zur Preuss. Pharmakopoe, 2, 207.)

Separation: a. Of solid Anethol (Anise or Fennel Camphor) from Oil of Anise, Fennel, or Star-anise (see p. 191). The commercial oil is left to solidify at 0°, and pressed between filtering paper (Saussure) as long as the paper takes anything up, then crystallised two or three times from alcohol of sp. gr. 0.85 (Cahours), from warm alcohol of 90 p. c. and freed from adhering alcohol by fusion. (Blanchet & Sell.) The water which passes over with oil of fennel, deposits anethol, on keeping, in broad white lamine. (Bizio, Brugn. Giorn. 19, 360.)

b. Of liquid Anethol from Oil of Fennel or Oil of Tarragon. Oil of formel is subjected to fractional distillation, and the portion collected.

fennel is subjected to fractional distillation, and the portion collected which passes over at 225° (Cahours); or the same process is applied to oil of tarragon, and the portion collected which passes over at 200 (Laurent); the last portions of the distillate are collected and rectified till a product of constant boiling point is obtained. (Gerhardt.)

Properties. Anethol exhibits totally different properties, according

as it is obtained from one or other of the above-mentioned oils.

a. Solid Anethol from Anise, Fennel, or Star-anise oil. Anise-camphor, Stearoptene of Anise-oil. — White, granular mass. (Saussure). White shining laminæ. (Cahours.) Hard as white sugar (Saussure); friable, especially at 0°; melts at 16° (Blanchet & Sell), 18° (Cahours), 20 (Saussure); at 15° in the fresh state; at 20°, after keeping for a year. (Birio.) Boils at 220° (Blanchet & Sell); at 222°, almost without decomposition (Cahours), and without alteration of the melting point. (Blanchet & Sell.) Sp. gr. of solid anethol at 12° = 1.044; in the liquid state at 25° = 0.9849; at 50° = 0.9669; at 94° = 0.9256, the sp. gr. of water at 12° being supposed = 1. (Saussure.) Has a fainter and more agreeable odour than anise-oil. Vapour-density = 5.19 at 338°, greater at

able odour than anise-oil. Vapour-density = 5·19 at 338, greater as lower temperatures. (Cahours, Compt. rend. 20, 51; Pogg. 65, 420; comp. vii, 54.) Permanent in the air. (Blanchet & Sell.) Less volutile as ordinary temperatures than common camphor.

b. Liquid Anethol from Oil of Fennel. Oil which does not solidify at 10°. Lighter than water. Boils at 225°. (Cahours, see p. 191.)

c. Liquid Anethol from Oil of Tarragon. Colourless mobile oil, having the taste and odour of oil of tarragon. (Laurent.) Smells like oil of anise. (Gerhardt.) Sp. gr. 0.945 at 15°. Boils at 206°. Vapour-density = 6·157 (Laurent), 5·34. (Gerhardt.) Permanent in the air. (Laurent.) the air. (Laurent.)

						Dumas.	Blanchet. & Sell.
20 C	*************	120	****	81.08	********	80.18	 80.71
12 H		12		8.11	********	8.28	 8.13
20	***************************************	16	****	10.81	******	11.54	 11.16
C20H15	O ²	148	-	100-00	*******	100.00	 100.00

	Cahours.	Laurent.	Gerhardt.
20 C	80.96	 81.00	 80.81
12 H	8.12	 8.85	 8.46
2 0	10.92	 10.15	 10.73
C20H12O2	100-00	 100.00	 100 00

C-vapour	Vol.	Density. 8.3200
H-gas O-gas	12	 0·8316 1·1093
Vapour of anethol	2	 10·2609 5·1305

Solid anethol from anise-oil (Dumas); liquid from tarragon-oil (Laurent, Ger hardt). Blanchet & Sell examined solid anethol from anise and fennel oil; Cahours, solid anethol from anise-oil, and liquid from fennel oil with like results. of tarragon-oil, Laurent formerly gave the formulæ C24H16O2 and C32H31O3.

Decompositions. 1. Anethol exposed to the air in the liquid state gradually loses the capability of crystallising (Cahours), and finally changes to a resin. (Saussure) Melted anethol, but not the solid substance, absorbs oxygen from the air and thickens. (Blanchet & Sell, comp. p. 192.)

2. Anethol is inflammable, and burns easily with red, smoky flame.

(Günther, Laurent.)

3. Hydrated phosphoric acid converts it into anisoin. When distilled with anhydrous phosphoric acid, it does not give off any hydrocarbon, but is converted into anisoin, part of which is decomposed during the

distillation. (Cahours.)
4. Oil of anise mixed with small quantities of oil of vitriol, becomes heated, acquires a fine blood-red colour, and is converted into anisoin. It dissolves completely in 3 or 4 pts. of oil of vitriol (even in the fuming acid), and after 24 hours, water separates part of it as unaltered oil, while the other portion remains dissolved, probably as sulphanetholic acid. (Cahours.) Tarragon oil is turned brown and resinised by fuming sulphuric acid, and on adding water, anison is precipitated, while a portion remains dissolved in combination with sulphuric acid. (Laurent.)

5. Solid anethol in contact with sulphurous (or hydrochloric, comp. p. 195) acid gas becomes liquid, absorbs a quantity of gas increasing as the pressure is higher and temperature lower, then gradually gives off a small quantity of carbonic acid, and remains liquid even after the gas

has been driven off, (Bineau, N. Ann. Chim Phys. 24, 335.)

6. Anethol dissolves iodine quickly at mean temperature, becoming thick after a few hours, and changing in a few days into a brown brittle resin. (Guizot, J. Phys. 5, 230). This is doubtless anisoin. (Kraut.) Anethol, dropped into aqueous iodide of potassium saturated with iodine, solidifies to a hard friable mass of anisoin. (Will & Rhodius, Ann. Pharm. 65, 230.) Sec page 197.

7. Bromine, dropped upon anise-camphor, causes much development of heat and evolution of hydrobromic acid gas, at the same time losing its colour and forming crystallisable terbromanethol. Oil of fennel form

viscid liquid product with bromine. (Cahours.)

8. Dry chlorine gas is rapidly absorbed by oil of anise, with rise of temperature and evolution of hydrochloric acid gas. The resulting products, which are viscid and semifluid at mean temperature, are richer in chlorine in proportion as the action of that gas has been longer continued, so that at first terchloranethyl is produced, then, if the action be assisted by a gentle heat, the compound CoCloH71Oo, into which, perhaps, it is still possible to introduce a further quantity of chlorine. (Cahours.) Tarragon oil immersed in chlorine gas, thickens, becomes hot, give of

acid vapours, and forms Laurent's chlorure de dragonyle.

9. Tarragon oil and star-anise oil, distilled with 8 pts. of chloride of lime and 24 pts. water, yield chloroform. (Chautard, Compt. rend. 34,

485; J. pr. Chem. 56, 238.)
9a. When anise oil is poured upon chlorate of potash and a few drops of oil of vitriol are added, inflammation takes place. (A. Vogel, jun.

Ann. Pharm. 74, 114.)

10. Pentachloride of phosphorus acts violently on anethol, giving of hydrochloric acid, and forming oxychloride of phosphorus, together with a chlorinated oil which is precipitated by water, cannot be distilled without decomposition, and appears to be C20H12Cl2. (Kraut.)

11. Nitric acid forms with anethol, according to the degree of con-

centration, temperature, and duration of action, either anisoic acid, or, together with oxalic and carbonic acids, -anisylous acid, anisic acid, andfinally nitranisic acid. By the action of fuming nitric acid, binitranisoin

is produced.

When star-anise oil is heated with nitric acid of sp. gr. 1-2, till the oil begins to sink to the bottom, anisoic acid (vide inf.) is produced (Limpricht & Ritter, Ann. Pharm. 97, 364.) When anise oil is heated with dilute nitric acid (with 3 vols. nitric acid of 14° Bm., according to Cannizaro & Bertagnini) it sinks to the bottom, and is converted into anisylous acid (xiii, 120). By continued heating with nitric acid of 23° to 24°, it is converted, with violent action, into a brown resident (anisola? Kr.) and anisic acid (Cahours, xiii, 123). Nitric acid of 34 to 36° acts with great violence, first producing anisylous acid in the form of a heavy oil, which disappears after the action has been continued for some time, and if water be then added, nitranisic acid (xiii, 137) is thrown down in yellow flocks. (Cahours.) Fuming nitric acid acia with extreme violence, giving rise to abundant evolution of red vapours and forming binitranisoin. (Cahours.) Nitric acid of ordinary strength does not act upon oil of tarragon in the cold, but on the application of heat, a violent evolution of gas takes place, and the oil thickens, swells up, and finally solidifies to a brown crystalline resin, a mixture of anist acid, aniso-nitranisic acid (xiii, 140), nitranisic acid, and a brown ress, which may be converted into these acids by further treatment with miles acid. (Laurent.)

12. Anethol is not at all altered by boiling with aqueous potash or by fusion with hydrate of potash (Gerhardt); not even by alcoholic potash (Kraut.) Heated to 300° in a sealed tube with soda-lime, it is attacked apparently with evolution of hydrogen, and yields a small quantity of at acid isomeric with cuminic acid. (Gerhardt.) When passed over sola lime at a low red-heat, it is partly carbonised, partly volatilised without alteration; no acid was found either in the aqueous solution of heated

mass or in the residue. (Kraut.)

13. A mixture of chromate of potash and sulphuric acid converts anethol, with violent intumescence, into anisic acid, acetic acid passing over at the same time. (Persoz, Hempel: comp. xiii, 124.) Rochleder (Ann. Pharm. 37, 347) likewise observed the formation of a peculiar acid on heating fennel oil with sulphuric acid and bichromate of potash.

14. With bichloride of tin (or terchloride of antimony) anethol thickens to a stiff red mass in which a few needles are perceptible, and from which anisoin is separated by water, alcohol or ether. (Gerhardt.)

By distillation over fused chloride of zinc, anethol is converted into a

mixture of metanethol and metanethol-camphor. (Gerhardt.)

16. Anethol heated with chloride of benzoyl in a sealed glass tube to 120°-140°, becomes viscid and brown. On distilling the product, the greater part of the chloride of benzoyl passes over without evolution of hydrochloric acid, and on further heating, a decomposible residue is left which appears to be anisoin. (Kraut.)

Combinations. Anethol dissolves slightly in water, the solid variety less easily than the liquid, imparting its smell and taste. The solid variety crystallises on cooling from the boiling solution in long needles. (Günther.)

With Hydrochloric acid. — Observed by Homberg (Crell. N. Chem. Arch. 3, 242) and by Sanssure. — Anethol absorbs 19.83 per cent. of dry hydrochloric acid gas, and forms the compound C20H12O2,HCl. (Cahours.) Calculation = 19.78 HCl. Solid anethol is converted thereby into a limpid liquid, which, after a few hours, spontaneously assumes a fine red colour, and after a few days, gives off a third of the absorbed gas. Water removes the red colour, and yields a thick, white, opaque mixture. (Saussure.)

Anethol does not unite with alkaline bisulphites. (Bertagnini, Ann.

Pharm. 85, 180.)

It dissolves in alcohol and in all proportions in ether. Solid anethol is less soluble in alcohol than the liquid variety. The solution is not precipitated by water. (Günther.) Anethol from tarragon oil dissolves in an equal volume of warm alcohol. (Laurent.) Solid anethol from anise oil dissolves at 10° in 4 parts, and at 15° in 0.6 pt. alcohol of sp. gr. 0.806 (Saussure), and crystallises by spontaneous evaporation of the alcohol at 5°. (Bizio.)

Anethol dissolves in 10 pts. of oil of turpentine and in an equal quantity of oil of almonds on heating, and crystallises on cooling. (Günther.)

Appendix to Anethol.

Oils almost wholly composed of Anethol.

a. Oil of Anise. Prepared from the bruised seeds of Pimpinella Anisum by distillation with a six-fold quantity of water. (Pharm. boruss. ed. 6.) — It is generally obtained from anise chaff, 100 lbs. of which yield 10½ oz. of the oil. (Martius); 100 lbs. of anise seed yield 26½ oz. (Van Hees, N. Br. Arch. 61, 18); 32½ (Zeller, N. Jahresb. Pharm. 1,148); 331 oz. (Martius, Repert. 39, 238.)

Fallow. (Blanchet & Sell.)
So or feet to be at 25 Ten Hees, 1988, at 25 Samuere, 0.991
at 17 Tennion. 1977 at 27 Ten Hees, 1988, at 25 Samuere, 0.991
at 17 Tennion. 1977 at 27 Tennion of the recently prepared oil,
if it is an interpretable of the self at 28 Tennion of the recently prepared oil,
if a contract of the self and poor native in it. (Blanchet & Sell.)
if a contract of the self community self and in the Banchet & Sell, from
every sum for if the self community may be an at 10 (Blanchet &
Self at 12 Tennion sometimes in viver only on opening and
smalling the vision and their instably. Frember: Crystalline less
easily the token the Tennion sometimes. The collobration from the
sected a more final than that notation of Tom the chaff, which crystalline
stoner, and contains note minimize. Nature. Melts at 17. (Samsure. When exposed to the air intrinses the trayer and becomes visid
Boardenet is Self, residues to these has turn som, accele acid being
fremed toly towards the end of the traces. Burio. It dissolves at 24
in 24 that if a residual first grants and in all proportions in cold
already of grants and 11 in any grant. Boarden & Self.)

in the same marrier as their arise from the seeds of Ascalum Paralelum in the same marrier as their arise from table seeds p. 196). — 100 ha of the seeds me to be a decreased. Var Hees Zeller.) Colouries of vehicular Levis. Sold fees tellow 10 Margneria, J. JAyr 45, 136, but often remains equitiered at lower temperatures. Sp. gr. 0.86 at 155 Chardin. 1965 at 105 Var Hees. 0.87. Lewis, Hasse). Smells like fermel seeds. Barriert a Sell. Tastes midd sweetish. Contain, according to Gribel Tile per cert. C. 1964 H. and 146 O; according to Blanchet a Sell. Tellow H. and 14 50. It consists almost entirely of two rises a light only large between 185 and 1907, isomeric with all of targettine, and anethal symetimes solid, sometimes liquid. (Calcure)

The same estimate part if fernel all contains \$7.56 p. c. carbon, 1157 hydrogen at 10.77 hydren Cahrurs, but it is difficult to purify it completely from another. It there is an incomes turbed when nitric oxide has it passed into it and if alother if sport, 0.8 be then added to the liquidity a peculiar white substance is deposited containing Contention This substance forms delicate white slaw needles which turn yellow at 100% and are completely icomposed at a stronger heat. (It dissolves in strong peta-heley and is precipitated therefrom by acids. It dissolves in ether, samely in alother if 0.80, and sparingly in absolute alcohol [Cahours, N. Alon Chien, Fig. 2, 303]. Heated with hydrate of soft, it gives off amounting a masswhich irritates the eyes, and an oil having the colour of rock-oil. It is not attacked by hyposulphite of soft with an acid, it vields a precipitate which detonates slightly when heated Boiled with hydrosulphate of ammonia, it dissolves with brown colour, deposits sulphur, and emits a strong odour of bitter almonds. (Chioms, Gerhardt's Traité, 3, 357.)

Calculation acc	rieg to	Cakours.	Cabours.
60 C	360	33.35	55.41
48 H	45	7:40	7.41
8 8	112	17:28	17:19
16 O	128	19 77	19-99
04-51114 51613	* • • •	100.00	100.00

ANISOIN, 197

c. Oil of Star-anise. From the seeds of Illicium anisatum. 100 lbs. of the seeds yield 40 oz. of oil (Van Hees), 35 oz. (Zeller). Mobile oil, transparent and colourless at first, but turning yellow after a few weeks. Does not solidify at 2.5°. (Meissner.) Deposits a camphor, like anise-camphor. (Cahours.) Sp. gr. 0.976 at 20°. (Van Hees.) Smells and tastes like anise. Dissolves readily in alcohol and ether. (Meissner, Alman. 1818, 63.)

d. Oil of Tarragon. Obtained by distilling with water the leaves of Artemisia Dracunculus.—Sp. gr. 0.9356. (Chardin-Hardancourt.) According to Laurent, it consists wholly of anethol, and boils between 200° and 206°. According to Gerhardt, it contains, together with anethol, extremely small quantities of a more volatile hydrocarbon.

Anisoin, C20H12O2.

GERHARDT. (1839.) Ann. Chim. Phys. 72, 167; in detail, Compt. chim. 1845, 65; J. pr. Chem. 36, 267; abstr. Compt. rend. 20, 1440. Cahours. Rev. scient. 1840, 342; J. pr. Chem. 22, 59; in detail N. Ann. Chem. Phys. 2, 284; J. pr. Chem. 24, 344. Laurent. Rev. scient. 10, 5; J. pr. Chem. 27, 232. WILL & Rhodius. Ann. Pharm. 65, 230; Pharm. Centr. 1848, 230. Uelsmann & Kraut. J. pr. Chem. 77, 490.

Resinous variety of anethol (Gerhardt).

First observed in 1826, by Unverdorben (Pogg. 8, 484), afterwards re-discovered and investigated by Gerhardt. Uelsmann & Kraut showed that the product which Will & Rhodius obtained by the action of iodine on anise oil, was anisoïn, as Gerhardt (N. J. Pharm. 14, 130) had previously suggested.

Formation. By the action of bichloride of tin or terchloride of antimony (Gerhardt), of phosphoric acid or oil of vitriol (Cahours), of iodine dissolved in iodide of potassium (Will & Rhodius) on anethol.

Preparation. 1. Bichloride of tin is poured upon anethol (or upon crude oil of anise or tarragon); the thick red mass thus produced is precipitated with water; and the precipitated flakes are collected and purified by solution in ether and evaporation. (Gerhardt.)—2. Anethol is treated with terchloride of antimony, till it turns red, and the mixture is diluted with water and boiled, whereupon the mass turns white and settles down.—The deposit is collected and washed, then pressed between bibulous paper, and purified by solution in a small quantity of ether and precipitation with weak alcohol. (Gerhardt.)—3. Oil of vitriol is dropped upon oil of tarragon contained in a large basin, care being taken that the mass does not become too strongly heated. A bard, fissured mass is thereby formed, which must be well washed with hot water. (Gerhardt.) Cahours uses at most 1½ pt. oil of vitriol to 1 pt. anise oil, and distils carefully after washing with water, whereupon, according to his statement, a small quantity of anison passes over, the greater part being however converted into a heavy oil (see page 200, 2).—4. A cold-

saturated solution of iodide of potassium is saturated with iodine; anise or fennel oil is then dropt into it, with strong agitation; and the thick gelatinous magma is diluted with 6 or 8 vols. alcohol. Anisoin then separates as a white powder, which is to be washed with alcohol; its quantity amounts to more than half that of the oil used; in the case of fennel oil to 54 8 p. c. - (Will & Rhodius).

To obtain the anisoin pure, it must be repeatedly dissolved in ether and precipitated by alcohol. - Or the brittle product obtained by the action of iodine upon anethol may be pulverised; ether then poured upon it; the solution shaken up with excess of soda-ley; the decanted etheral solution precipitated with alcohol; and the precipitated anisoin washed repeatedly with water, then dried, pulverised, and purified by repeated solution in ether and precipitation by alcohol. (Kr.)

Properties. Yellow, transparent resin, or thin microscopic nodules. (Gerhardt.) White powder (Will & Rhodius), which, by spontaneous evaporation of its ethereal solution, may be obtained in small needles. (Cahours.) Extremely electrical. (Will & Rhodius.) Melts between 140° and 145° (Uelsmann & Kraut); at a heat considerably above 100°, and solidifies to a colourless glass. (Will & Rhodius.) At a higher temperature, it volatilises partly undecomposed. Heavier than water. Inodorous. (Cahours.)

					Gerhardt	Cahours.	1	Wells & Rhodius.	_	
					mean.	mean.				MISS.
20 C	120		81.08	entrens.	80.75	 80.97		77:84		80-69
22 H										
20										
C20H12O2	148	****	100.00	monit	100.00	 100-00		100.00	9997	100-00

Will & Rhodius gave the formula C30H18O4. Isomeric with anethol, metanethol, metanethol-camphor and cuminol.

Decompositions. 1. Anisoin when heated in the air, burns like a resin, emitting an aromatic odour. (Cahours.) - 2. By distillation, it is converted into methanethol and metanethol-camphor, into the last, espe-

cially when pure anison is used. (Gerhardt, comp. p. 199.)

3. In chlorine gas, at mean temperature, it turns violet, absorbs chlorine, gives off hydrochloric acid, and becomes heated without melting-When chlorine gas is passed over anisoin at 100° as long as the substance continues to increase in weight, and the excess of chlorine is displaced by dry air, a chlorinated product is formed, without violet colouring, which contains 51.5 to 52.7 p. c. carbon, 4.5 to 4.8 hydrogen, and 31.9 to 32.7 chlorine, and, according to Will & Rhodius, is CoocleHard, more probably CocleHard = Bichloranisoïn. (Uelsmann & Kraut.) Calcalation 55.3 p. c. C, 4.6 N and 32.7 Cl. - 4. Anison is decomposed by strong nitric acid, only after continued boiling. (Will & Rhodins.) By fuming nitric acid, it is dissolved, with violent evolution of nitrous gas, and precipitated, on pouring the solution into water, as binitraniscia. (Krant.) — 8. Potash-lime attacks it at 300°, with evolution of hydrogen Hydrochloric acid separates from the product yellow flakes which call together to a brown resin. (Gerbardt.)

A nisoïn is insoluble in water. — It is not altered by dilute and a

by potash or ammonia, even at the boiling heat.

It dissolves in oil of vitriol with red colour and is precipitated by water. (Cahours.)

It does not dissolve in *alcohol*, even with the aid of heat. It is soluble in *ether*, and is completely precipitated from the solution by alcohol: also in volatile oils.

Metanethol-camphor.

C20H12O2.

GERHARDT. (Comp. page 197.)

Crystallised variety of Anethol (Gerhardt).

Formation and Preparation. — 1. Metanethol obtained by the dry distillation of anison (especially if pure), as above described, deposits in the neck of the retort crystals of metanethol-camphor, which may be obtained in greater quantity by once rectifying the metanethol over chloride of zinc, and separated from the oil by washing with alcohol. — 2. In the preparation of metanethol by dropping anethol on chloride of zinc in the melted state (p. 200) crystals of metanethol-camphor are obtained, abundantly if oil of anise has been used, in small quantity if the preparation has been made with oil of tarragon.

Properties. Colourless crystals which do not melt at the heat of the water-bath after fusion, and distil without alteration at higher temperatures. Solidifies to a radiated warty mass. Inodorous.

	Cryst	Crystals.						
	20 C 12	0 81	·08	81.45				
	12 H 1:	2 8	·11	8.15				
_	2 0 1	6 10	·81	10.40				
-	C ²⁰ H ¹² O ² 149	3 100	·00	100.00				

Isomeric with anisoin, metanethol and cuminol.

By repeated rectification over chloride of zinc, it is converted into metanethol, with separation of charcoal. With potash-lime it behaves like anisoin (p. 198).

Metanethol. C10H12O2.

GERHARDT. Compt. chim. 1845, 65; J. pr. Chem. 36, 372; abstr. Compt. rend. 20, 1440.

Liquid variety, e, of anethol (Gerhardt).

Formation. By distilling anethol over chloride of zinc. — 2. By the dry distillation of anisoïn (p. 198). — 3. In the dry distillation of the sulphanethates, metanethol passes over and charcoal is separated.

Preparation. Anethol is dropped upon melted chloride of zinc contained in a tubulated retort; heat is applied as long as oil continues to pass over; and the metanethol-camphor produced at the same time is reconverted into metanethol by repeated rectification over chloride of zinc. Oil of tarragon yields more metanethol and less of the camphor than oil of BUILD.

Properties. Colourless oil, having a vinous odour somewhat re-sembling that of anise. Sp. gr. 0.954 at 25°. Boils at 206°. Vapour-density = 5.75 at 247°; 5.35 at 297°.

						Vol.	Density.
20 C	120		81.08		80-55	C-vapour 20	8-3200
12 H	12	****	8-11	****	8-30	H-gas 12	0.8316
20	16	-	10.81	****	11.15	O-gas 1	1.1093
CasHraOa -	148	****	100.00	****	100-00		10-2609 5-1300

Isomeric with anethol, metanethol-camphor, anisoin and cuminol.

Sulphometanethic Acid.

 $C^{20}H^{12}S^{2}O^{8} = C^{20}H^{12}O^{2},2SO^{3}.$

GERHARDT. (1845.) Compt. chim. 1845, 65; J. pr. Chem. 36, 275.

Sulphanethic acid, Sulphodraconic acid, Metanethschwefelsaure, Metanetholschwefelsäure.

Known only in combination with bases.

Formation. - 1. By dissolving anothol in oil of vitriol. (Gerhardt.) - 2. The solution of anethol (from anise oil, according to Cahours, from tarrage oil, according to Laurent), in at least 3 or 4 pts, of oil of vitriol, if mixed with water after standing for 24 hours, deposits only part of the oil in the form of anisoin, the rest remaining dissolved in combination with the sulphuric acid, probably as sulphometanethic acid (p. 193). - 3. When thymol is heated with excess of oil of vitriol to 240°, sulphurous acid " evolved, and a viscid mixture perfectly soluble in water is obtained, which, after neutralisation with carbonate of baryta, yields a gummy very soluble salt, which behaves to ferric salts like sulphometanethate of baryta. (Lallemand, N. Ann. Chim. Phys. 49, 150.)

On diluting with water the solutions obtained by 1 or 2, neutralising with carbonate of baryta, filtering and evaporating, sulphometanethate of baryta is obtained as a yellow, amorphous, gammy mass, which has a very bitter taste, dissolves readily in water and alcohol, does not precipitate the nitrates of calcium, lead, or silver, and produces with aqueous ferric salts, a deep violet colouring, which is destroyed by ammons and by acids. This, and the lead-salt of sulphometanethic acid, which is like wise amorphous, has the aspect of gum arabic, and is very soluble is water, yield by dry distillation, a distillate of metanethol with a residue

of charcoal. (Gerhardt.)

Baryta-salt, salt at 1	00°.		Gerhardt.		
20 C	120		39-40	********	38-4
12 H		****	3.94	*******	4.3
BaSO4	116.5	****	38.26	*******	35.0
805	56	****	18.40		

CMH11BaO2,2SO3+HO 304.5 100.00

Lallemand found in sulphometanethate of baryta prepared from thymol, crystallised from weak alcohol and dried at 120°, 39·5 p. c. sulphate of baryta (C²⁰H¹¹BaS²O⁸ = 39.4 p. c- BaO).

Gerhardt's analysis does not agree with his formula, for which he erroneously

calculates the amount of sulphate of baryta, at 34.6 p. c. (Kr.).

Eugenin.

$C^{20}H^{12}O^4 = C^{20}H^{12}O^2, O^2$?

Bonastre. (1833.) J. Pharm. 20, 565; Ann. Pharm. 13, 91. DUMAS. Ann. Chim. Phys. 53, 168; Ann. Pharm. 9, 71; Pogg. 29, 89.

Discovered by Bonastre, analysed by Dumas.

Separates after a while from the turbid water, loaded with volatile oil, which is distilled from cloves. (Bonastre.)

Delicate, white, transparent, pearly laminæ, becoming yellowish after

Smells fainter than cloves. Tasteless. some time.

C20H12O4	164		100.00	1	100:00
4 0	32	****	19.51		21.14
2 H	12	****	7.32	*******	7.65
20 C	120	****	73.17		71.21
					Dumas

Isomeric with cuminic and eugenic acids, to the latter of which it is related in the same manner as benzoin to bitter almond oil.

With cold nitric acid, it acquires a bright blood-red colour as quickly as eugenic acid. (Bonastre.) Is but very slightly attacked by strong nitric acid. (Muspratt, N. Phil. Mag. 2, 297.)

Soluble in all proportions in alcohol and ether. (Bonastre.)

Eugenic Acid.

$C^{20}H^{12}O^4 = C^{20}H^{12}O^2, O^2$

Bonastre. (1827.) J. Pharm. 13, 464 and 513; abstr. Ann. Chim. Phys. 35, 274; Pogg. 10, 611; Mag. Pharm. 20, 141.

DUMAS. Ann. Chim. Phys. 53, 165; Ann. Pharm. 9, 65; Pogg. 29, 87; Ann. Pharm. 27, 151.

ETTLING. Ann. Pharm. 9, 68; Pogg. 31, 526.

BOCKMANN. Ann. Pharm. 27, 155.

STENHOUSE. Ann. Pharm. 95, 103; Pharm. Centr. 1855, 289.

CALVI & CHIOZZA. Cimento 3, 419; Ann. Pharm. 99, 242; J. pr. Chem. 70, 125; Chem. Centr. 1856, 829.

A. BRÜNING. Ann. Pharm. 104, 202; J pr. Chem. 73, 156.
 C. GREV. WILLIAMS. Chem Gaz. 1858, 170; Ann. Pharm. 107, 238;
 N. Ann. Chim. Phys. 54, 433.

Eugenol, Nelkensäure, Acid Oil of Cloves.

Bonastre discovered in 1827 the acid nature of oil of cloves, and investigated the remarkable compounds with alkalis and other sult-bases, which had already been observed by Philipp (N. Tr. 9, 1, 275) and Karls (Pogg. 10, 609).

Sources. Occurs in oil of cloves (Bonastre), together with a hydrocarbon isomeric with oil of turpentine (Ettling); in pimento-oil (Bonastre); in the so-called oil of ciunamon leaves from Ceylon (Stenhouse); in the oil of Canella alba (W. Meyer & v. Reiche); and probably in the volatile oil of Brazilian clove-cinnamon. (Comp. p. 209.)

Separation of Eugenic Acid from Oil of Cloves. The oil distilled from cloves which have been previously treated with alcohol to extract caryophyllin, consists solely of eugenic acid. (Dumas, Ann. Pharm. 27, 151.)

1. Crude commercial oil of cloves is mixed with strong potash-ley, and distilled as long as neutral oil of cloves passes over; the residue is then mixed with phosphoric or sulphuric acid; and the eugenic acid thus separated being distilled off, passes over as a clear colourless oil. (Ettling.)—2. Oil of cloves is decomposed by hydrate of potash; alcohol is added to the solidified mixture; and the salt thereby separated is collected and frequently pressed. The potash-salt is decomposed with dilute sulphuric acid, and the liberated eugenic acid is dried over chloride of calcium and rectified. (Brüning.) Dumas dehydrates eugenic acid by boiling and distilling, because, when treated with chloride of calcium, it readily becomes coloured or forms eugenate of lime.

Properties. Clear, colourless oil, having an unmistakeable odour and taste of cloves. Sp. gr. = 1.0684 at 14° (Williams), 1.076 (Stenhouse), 1.079 (Ettling). Boils at 242° (Stenhouse), 243° (Ettling), 248° (Brüning), 251° (Williams), between 153° and 154° (253° I Williams), (Dumas). Vapour-density = 5.858 (Williams), 6.4; (this number is probably too high, since partial decomposition took place.) (Dumas, Calvi.) Reddens litmus-paper. (Ettling.) It neither affects blue litmus or turmeric-paper, nor even the aqueous, alcoholic, or ethereal solutions of these substances. (Bonastre.)

20 C 12 H 4 O	. 12	****	*******	7.40	7.44	****	71:7
C ²⁰ H ¹² O ⁴		_					-

1	Stenhouse		Calvi.		Bruning.		Williams.
20 C 12 H 4 O	7:31	****	and the	****	7.33	***	
C20H12O4	100.00	****	100.0	Carre	100-00	-1461	100-00

		Vols.	v	apour-density.
	C-vapour	20		8.3200
	H-gas			0.8316
	O-gas		*******	2.2186
Ī	Eugenic acid-vapour	2		11:3702
		1		

Stenhouse analysed eugenic acid from oil of cinnamon leaves; Dumas gave the formula C²⁰H¹²O⁵, or the same doubled; Ettling, C⁴⁸H²⁰O¹⁰. The formula C²⁰H¹²O⁴, which was previously proposed by Liebig (*Org. Chemie.* 337) and by Gerhardt (*Précis* 2, 171) was confirmed by Calvi, by Brüning, and finally by Williams.

Isomeric with cuminic acid and eugenin (p. 192).

Decompositions. The decompositions of crude oil of cloves are here inserted, as far as they may with probability be attributed to eugenic acid. - 1. Eugenic acid soon acquires a brown colour, even in perfectly full and hermetically sealed vessels. (Williams.) - 2. It becomes coloured after boiling for a certain time and leaves a brown residue; hence the vapour-density is found too high in vessels containing air. (Dumas, Williams.)—3. Oil of cloves is turned dark-brown by oil of vitriol (Gaultier de Claubry), first clove-red, then of the colour of wine-lees. (Bonastre.) Comp. also Brandes (N. Tr. 21, 1, 37). - 4. Chlorine-gas causes cooled oil of cloves to thicken, colours it green, imparts to it a balsamic odour, and becomes converted in a few days into hydrochloric acid. On submitting the whole to distillation, undecomposed oil passes over, leaving a resin. (Bonastre.) Oil of cloves, gently heated with powdered corrosive sublimate, turns purple-red; and, on application of stronger heat, a purple-red oil containing hydrochloric acid passes over, together with acid vapours, leaving a black residue. The same purple-red oil is likewise obtained by acting on oil of cloves with hydrochloric acid gas or aqueous hydrochloric acid. (J. Davy.) - Oil of cloves, in contact with chloride of lime, becomes warm and emits vapours, without however taking fire. (R. Böttger, J. pr. Ch. 76, 241.) The less volatile oil of cloves is turned brown by small quantities of *iodine*, and in 24 hours acquires an olivegreen colour; while the more volatile oil is turned first brown, then blue, and finally greenish blue. (Jahn, N. Br. Arch. 66, 141.) 5. Penta-chloride of phosphorus decomposes eugenic acid, and yields, amongst other products, a gas burning with green flame like chloride of methyl. — 6. With nitric acid, eugenic acid forms oxalic acid and a brown resin. (Brüning.) Oil of cloves readily takes fire with fuming nitric acid. Heated with a large quantity of nitric acid, it yields oxalic acid (Karls, Crell. Ann. 1785, 1, 302; Bonastre); with 4 of its bulk of nitrous former acid, the product of product of the product of the product of pr immediately turns dark red, with evolution of nitrous fumes, and then dissolves in water with dark yellow colour, which is rendered more intense by ammonia. (Bonastre.) — 7. Eugenic acid is converted by distillation over anhydrous baryta into a neutral oil, which is not affected by caustic potash, and, though possessing different properties, has the same composition and vapour-density as eugenic acid. (Calvi.) Eugenic acid distilled with an excess of baryta yields the hydrocarbon C¹⁸H¹² (xiii, 341) (Church, N. Phil. Mag. J. 9, 256).—8. Oil of cloves is not affected by dry permanganate of potash. (Böttger.)—9. With peroxide of lead it develops heat, and smokes, without however taking fire. -10. Oil of cloves is not affected by mercuric oxide, but it instantly takes fire, with emission of sparks and smoke, in contact with dry oxide of silver, with peroxide of silver prepared by electrolysis, or with oxide of gold. the oxides being thereby reduced to the metallic state. (Böttger, J. pr. Ch. 76, 241.)—11. In contact with dry nitroprusside of copper, oil of cloves acquires a violet colour, varying to cherry-red, and yields a slate-gray deposit; $\frac{1}{2000}$ pt. nitroprusside of copper is sufficient to produce a rose red coloration. Oil of turpentine prevents the reaction. (Heppe, N. Br. Arch. 89, 57.)—12. Eugenic acid in the form of potash-salt gives with iodide of ethyl, eugenate of ethyl; with chloride of benoyl (toluyl or anisyl) it forms benzo-eugenic anhydride (or the corresponding anhydrides).—(Cahours, N. Ann. Chim. Phys. 52, 189.)

Combinations. Eugenic acid dissolves sparingly in water, imparting its taste and odour.

With bases it forms the eugenates, the formula of which is C²⁰H¹¹MO⁴ or C²⁰H¹¹MO⁴,C²⁰H¹²O⁴; according to Dumas, C²⁰H⁴²O⁴,MO. They are for the most part crystallisable, and, with the exception of the barytasalt, readily decomposible by water and alcohol. The solutions of the eugenates of the alkalis become alkaline by evaporation. (Ettling.) By nitric acid they are coloured various shades between yellow and red; they are decomposed by other acids (partially even by carbonic acid, Ettling) with liberation of eugenic acid. (Bonastre.)

Eugenate of Ammonia. Eugenic acid absorbs 9.73 p. c. of its weight of dry ammonia-gas (Dumas); when dry ammonia-gas is passed over it it combines therewith, developing heat, but is not completely neutralized. (Ettling.) Oil of cloves in contact with ammonia-gas at 0°, thickens to a buttery, granular-laminaceous, yellow mass, which gradually becomes dark, and with more ammonia acquires the consistence of tallow. (Bonastre.) Small, very brilliant crystals. (Dumas.) Fragile, white lamine (Bonastre, Brüning); heavier than water, of strong odour, and sharp, burning taste. (Bonastre.) In the air it immediately parts with ammonia (Dumas); melts a little above 0°, and gives off ammonia. (Brüning.) Though permanent below 12° in sealed tubes, it is converted in the air into a volatile and rather darker oil, owing to loss of ammonia. (Bonastre.) Eugenic acid over which ammonia-gas has been passed to saturation, parts with ammonia when melted, and is converted into an acid salt; and if ammonia be again passed over this product, it re-absorbs the gas to the amount of 4.14 p. c. of the weight of the acid. (Ettling.) — Dissolves in hot ammoniacal water, and on distilling the solution, passes over with the liquid, and crystallises from the cooled distillate as a white semi-solid mass, which gradually disappears even in stoppered bottles. (Bonastre.) Commercial oil of cloves yields with ammonia no crystals, but a pitch-like, buttery mass. (Dumas.)

				Dumas. 90·61 9·39 8·86		
C ²⁰ H ¹² O ⁴					8.86	
C20(NH4)H31O4	181		100.00			ī

Eugenate of Potash. — Acid? — Oil of cloves is triturated with an equal weight of hydrate of potash, and the compound which is thus formed, with slight elevation of temperature, is dissolved in 5 pts, water (on boiling the solution a certain quantity of eugenic acid is driven off: Bennatre, Calvi), then filtered and evaporated, so that the liquid, when left to stand in the cold for 24 hours, crystallises. (Bonastre.) An excess of concentrated solution of caustic potash is added to eugenic acid, and, according

to Bruning, the solution is precipitated with alcohol and the salt repeatedly pressed; according to Dumas, the mass is stirred up, the excess of potash poured off, and the salt pressed between blotting paper, and crystallised from alcohol.

Brilliant, white, fragile lamine, having the burning taste, and somewhat of the odour of cloves. Reaction alkaline, (Bonastre.) Partly decomposed by recrystallisation from water. (Bonastre, Dumas.) According to Bonastre, it is also decomposed by alcohol and ether. Decomposes slightly at 100°, without perceptible alteration of weight. (Bruning)

			Bonastre 11 100° (Dumas.	runing.
CoHmOt		87·08 12·92	 mean. 11.69	710.	mean. 12·0	itrol. 12.22
C90H11KO4,C90H12O4	366.2	 100.00	-			

According to Bruning, the formula is C40H23KOS, + 2Aq, which requires 12.2

Eugenate of Soda. When oil of cloves is poured over an equal weight of hydrate of soda, it is gradually absorbed, forming a solid mass, which, on addition of a little cold water, is converted, in 24 hours, into fragile needles having a silky lustre. The excess of soda is removed by pressing the crystals between blotting paper. It tastes like cloves and strongly alkaline. On boiling the largely diluted aqueous solution, a small quantity of oil is evolved, but the liquid again yields crystals on evaporation. Dissolves in from 10 to 12 pts. cold, and in any quantity of hot water. Dissolves in alcohol and ether with decomposition. (Bonastre.)

Needles. Bonastre. C²⁰H¹¹O³ 155 NaO 31 83.34 81.45 16.66 18.57 C20H11NaO4 186 100.00

Eugenate of Baryta is precipitated in crystalline spherules when baryta water is shaken up with eugenic acid (or with its aqueous or alcoholic solution: Brüning), while only a small quantity remains in solution. The salt may be obtained in white nacreous needles by recrystallisation from hot water. (Bonastre.) The salt prepared from barytawater and eugenic acid contains 27 p. c. BaO, but after recrystallisation from alcohol, it contains 32 p. c. BaO. (Ettling.) Smells and tastes of cloves. (Bonastre.) It is very stable, and may be recrystallised from water and from alcohol. (Williams.) When moist, it absorbs carbonic acid from the air (Ettling), and turns brown. (Brüning.) Dissolves sparingly in cold, and much more freely in hot water. (Bonastre.) For the decomposition of the baryta-salt by distillation, see page 203 For the decomposition of the baryta-salt by distillation, see page 203.

			-		Bruning.
20 C	120	***	51.82	*******	51.12
11 H	11		4.75		4.89
30	24		10.36		12.23
BaO	76.5	****	33.07		31.76
C20H11BaO4	231.5		100-00		100.00

Bonastre found 32.81, Ettling 32.0, Calvi 32.8 (Gerhardt's Traité, 4, 1037), Williams, in the salt dried at 100°, 33'4 p. c. BaO.

Eugenate of Strontia. Obtained by boiling or agitating oil of cloves with strontia-water. White needles, less nacreous than the baryta-salt, with which they agree in other properties. (Bonastre.)

Eugenate of Lime. Quicklime combines with oil of cloves, forming a solid, amorphous compound, which is insoluble in cold and sparingly soluble in boiling water. — When oil of cloves is boiled with 2 pts of lime and water, the filtered solution deposits on evaporation yellowish crusts, which have a faint odour of cloves, a very repulsive taste, and are turned wine-red, with lively effervescence, by oil of vitriol. Dissolves in 235 pts. water. (Bonastre.)

Eugenate of Magnesia. Obtained by the action of oil of cloves on calcined magnesia, as a very hard, white, non-crystalline compound, which is equally insoluble in cold and hot water. (Bonastre.)

Eugenate of Lead. Eugenic acid forms with oxide of lead, acid, basic, and hyperbasic salts. (Ettling.) By boiling oxide of lead with all of cloves and water for three hours, a viscous, yellow, homogeneous mass, insoluble in water, is obtained. This when dried in the air becomes friable, and on addition of sulphuric acid, yields eugenic acid. Formel also by precipitating aqueous engenate of potash (from oil of cloves, comp. Schindler, N. Br. Arch. 41, 140) with subacetate of lead, as a thick, yellow (Bonastre.) Hyperbasic eugenate of lead contains 62 61 p.c. deposit. PbO. (Bonastre.)

Ferrous Eugenate. Boiling aqueous solution of eugenate of potash or soda gives immediately with ferrous sulphate, a magma which instantly turns blue. (Bonastre.) Aqueous ferrous sulphate gives no reaction with oil of cloves; but with eugenate of ammonia, baryta, or strontia, it acquires a light lilac-colour; with eugenate of potash, from red to blue; and with eugenate of soda, a violet or greenish-blue colour. (Bonastre.) By standing over iron filings for 24 hours, oil of cloue acquires a purple tint, without dissolving any of the iron (7 Kr.)—(Röttscher, Br. Arch. 14, 186.)

Cupric Eugenate. Solution of cupric sulphate precipitates aqueous eugenate of soda. The precipitate aggregates in a brown mass, which when boiled for half an hour, changes from sky-blue to the colour of verdigris. (Bonastre.)
Oil of cloves is completely soluble in concentrated acetic acid, alcohol,

and ether. (Bonastre.) It is insoluble in acetic acid of sp. gr. 1-05. (Jahn, N. Br. Arch. 66, 129.)

Appendix to Eugenic Acid.

1. Pyrolivilic Acid.

 $C^{20}H^{15}O^{8} = C^{20}H^{12}O^{4} + Aq(1).$

Sobrero. Ann. Pharm. 54, 87.

Preparation. Pure dry olivil (the crystalline resin of the wild clive tree) is slowly distilled in a retort, of which it occupies about one third

till the residual black mass begins to swell up. The pyrolivilic acid, which passes over as an oil together with water, is dissolved in ether, and the solution is distilled in a stream of dry carbonic acid, at a gradually increasing temperature. Ether, and all the water, first pass over, then the pure acid. (Chloride of calcium cannot be used for drying the acid, since it dissolves therein and cannot afterwards be separated.)

Properties. Colourless oil, heavier than water. Boils above 200°. It has an agreeable odour, and tastes and smells just like eugenic acid. Its aqueous solution reddens litmus.

					Sobrero.
20 C	120		69.36		69.99
13 H	13	****	7.51		7.31
5 O	40	****	23.13	*******	22.70
C20H13O5	173	-	100.00		100.00

Sobrero's analysis agrees very closely with Dumas's analysis of eugenic acid, but not with those of Böckmann and Ettling.

Decompositions. 1. Turns brown on exposure to the air, and afterwards acquires a reddish-brown colour. — 2. The potash-solution blackens and becomes opaque in the air, owing to deposition of carbon. — 3. If the solution be now decomposed with an acid, and the precipitated pyrolivilic acid distilled, a large quantity of charcoal remains in the residue and the distillate has the mean composition: 68.92 p. c. C, 7.64 H, and 23.440. — 3. It is converted by nitric acid into resin and picric acid. — 4. Reduces agree a nitrate of silver.

4. Reduces aqueous nitrate of silver.

Pyrolivilic acid is very slightly soluble in water. It dissolves readily in solution of caustic potash, without yielding a crystallisable salt. (This distinguishes it from eugenic acid.) — It dissolves chloride of calcium

and cannot again be separated therefrom.

Lead-salt. Subacetate of lead gives with alcoholic pyrolivilic acid, white curdy flakes, which become soft at 100°, and melt to a transparent, pulverisable, resinous mass; they dissolve in alcohol but not in water, and are precipitated from the alcoholic solution by evaporation or by dilution with water. The salt appears to vary greatly in composition. Prepared from the alcoholic solution by evaporation, it contains 57.30 p. c. PbO; precipitated from the same solution by water, 53.16 p. c. PbO.

Obtained by e	vapor	atio	n.		Sobrero
20 C	120		30.99		30.59
12 H	12		3.09	*******	2.89
40	32	1216	8.29	*****	8.89
2 PbO	224	****	57.63	******	57.63
C ⁵⁰ H ¹² O ⁴ ,2PbO	388		100.00	*******	100.00

Pyrolivilic acid dissolves readily in alcohol and in ether. Water precipitates the alcoholic solution. The ethereal solution, when left to evaporate, deposits the acid in oily drops.

Carmufellic Acid. C*H**O** (†).

Musphatt & Danson. (1851.) N. Phil. Mag. J. 2, 293; J. pr. Chem. 55, 25.

Formation and Preparation. About 20 lbs. of cloves are digested in a copper vessel with 36 lbs. water, and the whole is boiled for an hour. The dark-brown decoction is poured off, and the residue is repeatedly boiled with fresh quantities of water till the liquid is no longer coloured. The united extracts, amounting to about 270 lbs., are reduced by evaporation to 54 lbs., and divided into from 20 to 30 pts., each of which is mixed with cold nitric acid, and heated for several days in a covered vessel on a sand-bath. (If the extracts were evaporated to a syrup, a violent reaction would take place on treating them with nitric acid in the cold, and a blood-red liquid would be obtained.) A lively effervescence ensues, a suffocating gas which excites tears being evolved, together with carbonic acid and a few nitrous fumes, while the liquid, which contains a large quantity of oxalic acid, becomes pale yellow and deposits abundant white flakes. All the gas is completely expelled; the liquid filtered (this requires a long time); the residue washed with boiling water; and the filtrate evaporated, till it deposits yellow micaceous laminæ, which are dissolved in water and converted into a lead-salt by precipitation with acetate of lead. The washed lead-salt is decomposed by sulphurettel hydrogen, and the solution is decolorised with animal-charcoal and evaporated, whereupon dazzling white crystals of the acid are deposited. One pound of cloves yields about 2 grains of crude acid.

Properties. Brilliant, colourless, micaceous laminæ.

				Muspratt & Danson. At 100° (mean.)
24 C 20 H			34·29 4·76	
32 O		****	60.95	1111111111
C34H30O32	420		100.00	100-00

Decompositions. 1. Heated in a test-tube, it melts, gives off vapours smelling like burnt sugar, and yields yellow drops of oil. — 2. It is not attacked by cold oil of vitriol; but chars on application of heat, with evolution of sulphurous acid.

Combinations. Insoluble in cold, sparingly soluble in boiling water.

Combines with bases, forming salts. Their formula, according to Muspratt and Danson, is C²⁴H²⁰O¹², MO, and therefore probably C²⁴H¹⁹MO²⁵, HO. The acid dissolves in ammonia and in caustic potal. Its moderately dilute solution (in ammonia l Kr.) produces with soluble salts of baryta, strontia, and lime, transparent gelatinous precipitates which cause the solutions to solidify. It gives with salts of lead, a white transparent, gelatinous precipitate; with ferrous salts, white; with ferrous salts, bright yellow; with cupric salts, green; and with silver-salts, white flakes. The precipitates occupy an exceedingly small space after they

have been dried, and then resemble laminæ of mica. They dissolve with turbidity in dilute hydrochloric or nitric acid, except the lead-salt, which gives a clear liquid.

Carmufellate of Baryta. An equal number of atoms of carmufellic acid and acetate of baryta are dissolved in water; the mixed solutions are evaporated to dryness; and the residue is exhausted with water, and dried on a porous tile over oil of vitriol. - The precipitate obtained by throwing down nitrate of baryta with carmufellic acid, cannot after drying be separated from the filter.

Barely soluble in water, abundantly in hydrochloric and nitric acid.

Calculation accorded Spanson.	-	-		Muspra	att & Dans
C24H20O32			84·59 15·41		15.80
C24H20O32,BaO	496-5		100.00		

Carmufellate of Lead. Prepared like the baryta-salt. It is almost insoluble in water, but dissolves in nitric acid.

Calculation accord & Danson.	ling t	o Mi	uspratt	Musi	pratt & Danson	
PbO			78-95 21-05	ennen.	20.61	
C24H20O22,PbO	532	2011	100.00			

Carmufellic acid is insoluble in alcohol and in ether.

3. Volatile Oils containing Eugenic Acid.

a. Oil of Cloves. (Gewürznelkenöl.) - From the buds or flower stalks of Eugenia caryophyllata. 100 pts. of cloves yield from 14.5 to 28 pts. of oil (Comp. Jahn, N. Br. Arch. 66, 129; Zeller, N. Jahrb. Pharm. 1, 93); while the same quantity of stalks gives only 4 pts. (Van Hees, N. Br. Arch. 69, 41.) The oil does not pass over completely till the distillation has been continued for a long time. Colourless and transparent; odour burning, peculiar; taste sharp, biting and warm. Does not solidify at — 25°. (Bonastre) Deposits camphor in the cold. (Bizio.) Sp. gr. = 1.034 (Lewis); of the commercial oil, 1.055, of that (Bizio.) Sp. gr. = 1.034 (Lewis); of the commercial oil, 1.055, of that prepared by Bonastre, 1.061 (Bonastre); between 1.033 and 1.040 (Van Hees); between 1.046 and 1.058. The first portion of the distillate is lighter than the succeeding products, so that by fractional distillation oils of sp. gr. 0.95 and 1.076 may be obtained. (Jahn.) Prepared from clove-stalks it has a different odour, and a sp. gr. 1.049 (Van Hees, *Pharm. Centr.* 1847, 380); it then has a peculiar odour, like cabbage, and its sp. gr. is 1.051. (Jahn.) It is a mixture of neutral oil of cloves and eugenic acid (p. 202.) (Ettling), of the first of which the earlier portions of the distillate, as well as the oil from clove-stalks, contain a larger quantity. (Jahn.) Contains 73.6 p. c. C, 8.15 H, and 18.25 O. (Ettling.) b. Oil of Cinnamon-leaves from Ceylon. Obtained according to Pereira, by macerating cinnamon leaves in sea-water, and submitting the whole to distillation. Cheely resembles oil of cloves. Brown oil having a penetrating, aromatic older, strong, biting taste and sp. gr. 1653. Beaction acid. Converted by potash or ammonia into a buttery crystalline mass. It is a mixture of benzoic acid, engenic acid, and a hydrocarbon ChHot. — Stenhouse, Ann. Pharm. 95, 103.)

By treating oil of cinnam n-leaves with excess of aqueous potals, decanting the unlissalved oil, treating it with fragments of castic potasis, then with cilleride of calcium, and finally rectifying it over potassium the hydromation is obtained as a colourless oil which strongly refracts light, has a specific gravity 0.862, boils between 160° and 165, and smells like cymene. Contains 88:14 p. c. C, and 11:68 p. c. H, corresponding to the fermula C*H*. (By calculation, 88:24 p. c. C and 11:76 H.) — (Stenhouse.)

- c. Pimento-oil. Nelten ferent. Obtained from the fruit of Myrtus pimenta. The tools yield 10 p. c., the seeds 5 p. c. oil. (Bonastre, J. Pharm. 11, 187.) The whole fruit yields 1:9 p. c. oil (Braconot), 2:34 p. c. of sp. gr. 1:03. Jahn, N. Br. Arch. 66, 155.) Colourless of pale-yellow; it has a more agreeable smell and taste than oil of clove [Voigtel]. less agreeable [Bonastre], and slightly repulsive, recalling that of Myrtus commands. It refracts light powerfully. When poured into water, it separates into two portions, one of which floats while the other sinks. (Jahn.) Becomes dark yellow by keeping. (Voigtel) With 4th its bulk of nitrae acid, it immediately turns dark red, with effervescence, and forms a yellowish red solution, the colour of which is rendered more intense by ammonia. (Bonastre.) With oil of virie, nitric acid, and indicate the house like oil of cloves. Freshly distilled, it will not mix with ammonia, but after standing in contact with it for eight days, it is converted into a colourless crystalline mass. (Jahn.) According to Bonastre, it forms with alkalis the same solid compounds so oil of cloves. (J. Pharm. 13, 466. It mixes with an equal quantity of caustic potash-ley, thereby developing heat and becoming turbid; after wards the liquid becomes quite clear and viscid but on cooling it does not solidify in crystals, even on standing, and on addition of water is partly precipitated unchanged, while a resin remains in combination with the potash. (Jahn.) Dissolves completely in alcohol and ether (Bonastre.)
- d. Volatile oil of the Brazilian Clove-cinnamon. Obtained from Persa caryophyllata. (Martius.) Heavier than water, bright yellow, smells like oil of cloves, but less agreeably. Taste burning, like cloves. Burni with a bright flame, depositing much charcoal. It takes fire with funisy nitric acid. Forms with biss, compounds which are partly crystallisable, but can never be obtained neutral. Acids precipitate the oil unchanged. The compounds with ammonia, potash, and soda are crystallisable, but the lime-compound is not. Readily soluble in alcohol, from which it is precipitated by water.
- c. Valatile oil of Canella alba. By distilling white cinnamon, the bark of canella alba, with water and cohobating the distillate, 0.94 p.c. of oil are obtained. This in contact with aqueous potash parts with augenic acid, and on being distilled after several days, yields first a large

quantity of oil which floats on water (a and b), then a small quantity of oil heavier than water (c), while half resinised oil floats on the potashley which contains eugenate of potash in solution. The lighter oil has a strong aromatic odour, like oil of cajeput, and boils between 180° and 245° ; and by fractional distillation a first portion (d) is obtained at 180° , containing $75 \cdot 25$ p. c. C, $11 \cdot 28$ H, and $13 \cdot 46$ O. (If this be again fractionally and very slowly distilled, a portion boiling at 166° (aa) is obtained, yielding $79 \cdot 11$ p. c. C, $10 \cdot 64$ H, and $9 \cdot 25$ O. On further distilling the lighter oil, an oil (b) is finally obtained of sp. gr. $0 \cdot 941$, and boiling at 245° . It contains $80 \cdot 54$ p. c. C, $10 \cdot 77$ H, and $8 \cdot 69$ O. The oil (c) heavier than water does not combine with potash, and contains $73 \cdot 7$ p. c. C, $10 \cdot 7$ H, and $15 \cdot 6$ O. (W. Meyer & v. Reiche, Ann. Pharm. 47, 234.) Hence the oil of canella alba is a mixture of eugenic acid, cajeput oil, and an oxygenated oil. (Wöhler.)

Eugenate of Ethyl.

 $C^{24}H^{16}O^4 = C^4H^5O, C^{20}H^{11}O^3.$

Cahours. (1858.) Compt. rend. 46, 220; Ann. Pharm. 103, 265; J. pr. Chem. 73, 259; more detailed, N. Ann. Chim. Phys. 52, 189; Ann. Pharm. 108, 323.

Nelkenvinester, Eugenäthyl (Gm.). Nelkensaures Aethyl. Eugenic ether.

Formation and Preparation. By acting on eugenate of potash with iodide of ethyl in a sealed tube. The product is washed with dilute aqueous alkali, dried over chloride of calcium, and rectified.

Properties. Colourless oil, boiling at about 240°. It has an aromatic odour, slightly resembling that of cloves. Neutral.

					Cahours.
24 C	144	•	75.00		74.82
16 H	16		8:33		8 40
4 0	32		16.67	•••••	16.78
C4H5O,C20H11O3	192		100.00		100.00

It is violently attacked by bromine, chlorine, or fuming nitric acid, yielding a viscid product.

Insoluble in water. Readily soluble in alcohol and ether.

Benzo-eugenic Anhydride.

 $C^{34}H^{16}O^{6} = C^{14}H^{6}O^{3}, C^{20}H^{11}O^{3}.$

Cahours. (1858.) N. Ann. Chim. Phys. 52, 189; Ann. Pharm. 108, 321.

Benzoate of Eugenyl, Eugenate of Benzoyl, Benzeugenyl, Benzoe-Nelkensäure-Antydrid.

Preparation. Chloride of benzoyl is heated with eugenic acid as long as hydrochloric acid continues to be evolved, and until the mass,

which at first was viscous and dark brown, has become bright brownish-yellow. It is then left to cool in a stoppered vessel. The next day concentrated solution of potash is added to the mass (which sometimes a still fluid, sometimes solidified in crystals), whereupon it solidifies, and is washed with water, pressed between blotting paper and crystallised from boiling alcohol.

Properties. Colourless needles, bright amber-coloured when we quite pure, melting between 50° and 55°, and boiling above 360°.

				Cahours. mean.
34 C	204	••••	76.12	 75.72
16 H	16		5.97	 6.06
6 O	48		17.91	 18.22
C14H4O3,C20H11O3	268		100.00	 100.00

It is violently attacked by bromine and by nitric acid. It is not affected by cold or boiling aqueous potash, but is resolved by solid hydrate of potash into benzoate and eugenate of potash.

lusoluble in cold and boiling water. Dissolves in boiling alcohol and

in ether.

Toluo-eugenic Anhydride.

 $C^{36}H^{16}O^{6} = C^{16}H^{7}O^{3}, C^{30}H^{11}O^{3}.$

CAHOURS. (1858.) N. Ann. Chim. Phys. 52, 189; Ann. Pharm. 108, 322.

Tolunte of Eugenyl, Eugenate of Toluyl, Tolueugenyl Toluyl-Nelkendwe-Anhydrid.

Obtained and purified in the same way as benzo-eugenic acid, by the action of chloride of toluyl (C"CIH"O") on eugenic acid.

Needles resembling those of benzo-eugenic anhydride.

			Cabours
			mean.
36 C	 216	 76.59	 76:39
18 H	 18	 6.38	 6.48
6 ()	 48	 17:03	 17:13

Heated with fragments of caustic potash, it is resolved into toleste and eugenate of potash.

Insoluble in water. Dissolves somewhat readily in boiling alcohol, still more in other.

Aniso-eugenic Anhydride.

 $C^{36}H^{16}O^{6} = C^{16}H^{7}O^{5}, C^{30}N^{11}O^{3}.$

CAHOURS. (1858.) N. Ann. Chim. Phys. 52, 189; Ann. Pharm. 108, 323.

Anisete of Bugenyl, Eugenate of Anisyl, Aniseugenyl, Anis-Nelkensäure-Anhydrid.

Chloride of anisyl acts on eugenic acid in the same way as chloride of benzoyl, and yields a crystallisable product, insoluble in aqueous potash, and bearing the same relation to anisic acid, as benzo-engenic anhydride to benzoïc acid.

Cumino-eugenic Anhydride.

 $C^{40}H^{22}O^6 = C^{20}H^{11}O^3, C^{20}H^{11}O^3.$

CAHOURS. Compt. rend. 46, 220; Ann. Pharm. 105, 263; more detaile N. Ann. Chim. Phys. 52, 205; Ann. Pharm. 108, 323.

Cuminate of Eugenyl, Eugenate of Cumyl, Cumeugenyl, Cumin-Nelkensäure, Anhydrid.

Formation and Preparation Chloride of cumyl does not act upon engenic acid in the cold, but on heating, abundant vapours of hydrochloric acid are evolved, while the mixture becomes coloured and thickens. When the evolution of hydrochloric acid has ceased, and the mixture has become light brown and liquid, it is left to cool, and the excess of engenic acid or of chloride of cumyl is removed with concentrated potash-solution, whereupon the product solidifies in crystals. These are washed with water, pressed between blotting paper, and recrystallised from boiling alcohol.

Properties. Colourless, highly brilliant tablets, which melt at a gentle heat and volatilise when heated above 400°.

40 C22 H					77:11
22 H	00				
	22	••••	7.09	••••	7.14
6 O	48		15.49		15.75

Isomeric with cuminic anhydride.

Decompositions. Decomposed by oil of vitriol in the same way as by caustic potash (vid. inf.). — 2. Not affected by boiling hydrochloric acid.

—3. It is violently attacked by fuming nitric acid, being converted into a viscid, reddish yellow resin and a crystalline body. — 4. It is not affected by boiling potash-solution, but caustic potash in fusion decomposes it into cuminate and eugenate of potash.

Bromine-nucleus C20BrH13

Hydrobromate of Bromo-cymene.

C20Br2H14 = C20BrH13,HBr(1).

SIEVEKING. (1857.) Dissert. über Cuminol and Cymen. Gött, 1857; abstr. Ann. Pharm. 106, 261.

Bromide of Cymyl and Hydrogen, Cymylbromur.

Formation (p. 186).

Bromine is dropped into water, on which cymene floats, as long as the colour of the bromine continues to disappear, and the product is washed alternately with aqueous carbonate of soda and water, and then dried over oil of vitriol.

Colourless oil, heavier than water.

It cannot be distilled without decomposition. By prolonged boiling with alcoholic potash, it parts with all its bromine, being converted into an oil resembling cymene.

Chlorine-nucleus C20ClH18.

Hydrochlorate of Chlorocymene.

 $C^{20}Cl^2H^{14} = C^{20}ClH^{13},HCl(?).$

Sieveking. (1857.) Dissert. über Cuminol and Cymen. Gött. 1857; abstr. Ann. Pharm. 106, 261.

Chloride of Cymyl and Hydrogen, Cymylchlorur.

Formation (p. 186).

Chlorine is passed into water, upon which cymene floats, till the latter sinks. The product is washed with aqueous carbonate of soda and water and dried over oil of vitriol.

Limpid oil, containing 34, 41 p. c. Cl (C20H14Cl2 = 34.34 Cl).

It turns yellow by keeping and evolves hydrochloric acid. It cannot be distilled without decomposition. It is not further acted on by chlorine. Becomes hot with fuming sulphuric acid, evolves hydrochloric acid, turns brownish-red and forms sulphocymenic acid. Heated with alcoholic ammonia, it deposits chloride of ammonium. Boiled with alcoholic potash, it turns red, deposits chloride of potassium, and is converted into an oil, which is separable by water, and when distilled passes over colonrless at first, then coloured, evolves hydrochloric acid, and leaves a residue of charcoal. The distillate, after standing over hydrate of lime, distills between 170° and 230°, still contains from 10 to 12.6 p. c. chlorine, and has an aromatic odour.

Hydrochlorate of chlorocymene does not dissolve in water, and but slightly in alcohol.

Oxybromine-nucleus C20Br3H9O2.

Terbromanethol.

C20Br3H9O2.

CAHOURS. (1840.) Rev. scient. 1840, 342; J. pr. Chem. 22, 58; more fully, N. Ann. Chim. Phys. 2, 279; J. pr. Chem. 24, 337; Ann. Pharm. 41, 56.

Bromanisol, Bromanisal.

Formation (p. 194).

Preparation. Bromine is gradually dropped upon anise-camphor, till a slight excess has been added, and the mixture is allowed to solidify. A brominated oil is then extracted by small quantities of ether, and the residue is dissolved in boiling ether, and left to crystallise. The crystals thus obtained are still contaminated with a small quantity of oil; they are therefore pressed between blotting-paper and recrystallised from ether.

Properties. Rather large, colourless, highly brilliant crystals, which crack between the teeth. Inodorous.

Cry	stals.		Cahours. mean.
20 C 19	20	31.17	 31.52
3 Br 2-	40	62.38	
9 H	9	2.34	 2.66
2 O	16	4.16	
C ²⁰ BrH ⁹ O ² 38	35	100.00	

It is slightly decomposed by heat at 100°, and completely on distillation, with evolution of hydrobromic acid. It is not further acted upon by bromine.

Insoluble in water, slightly soluble in alcohol, more so in ether.

Oxychlorine-nucleus C20Cl3H9O2.

Terchloranethol.

C20Cl3H9O2.

CAHOURS. (1840.) Rev. scient. 1840, 342; J. pr. Chem. 22, 58. In detail.
N. Ann. Chim. Phys. 2, 281; J. pr. Chem. 24, 337; Ann. Pharm, 41, 56.

Chloranisol, Chloranisal.

Formation (p. 194).

Only once obtained by the not too prolonged action of dry chlorine on anise-camphor.

In the cold it is a colourless syrup, which becomes more liquid when heated, and decomposes completely when distilled, evolving hydrochloric acid and leaving a residue of carbon.

					Cahours
					men,
20 C	120-0	•	47:71	••••	47.72
3 Cl	106.2		42.34		41-92
9 H	9-0		3-57		3.66
2 0	16:0		6:38		6.70

Appendix to Terchloranethol.

Chloride of Draconyl.

CAHOURS. N. Ann. Chim. Phys. 2, 282.

LAURENT. Rev. scient. 1842, 5; J. pr. Chem. 27, 247.

Viereinhalbfachgechlortes Anethol. (Gm.)
Formation (p. 194).

Preparation. Auise-camphor (oil of tarragon, Laurent,) is acted upon at a moderate heat for a long time by chlorine gas, till all action has ceased. (Cahours.)

Colourless, semifluid, viscid and glutinous mass (Cahours) of the cossistence of turpentine. (Laurent.)

		12					
7 H		1	7.5	2.47	 2.75	•	3-30
CaCla	:.7:0	30.	j·2	100:00	 100-00		

The commound from oil of tarragon investigated by Laurent, has according to him, the formula C**CFH *O*, according to Gerhardt, perhaps C**CFH**O* (Traité 3,356).

Decomposes by distillation Cahours', and (when prepared from all of tarragon) evolves hydrochleric acid and vapours of a very thick oil, while a small quantity of carbon is left. (Laurent.) It is attacked by builing alcoholic potash. The oil thus changed, which is still very thick contains 42.5 p. c. C. and 3.4 H: according to Laurent = CacleHuO; according to Gerhardt, it perhaps differs from the preceding by containing less hydrochloric acid.

Nitro-nucleus, CXXH11

Nitrocymene.

 $G_{a}ZH_{a}G_{b}=G_{b}ZH_{a}$

BARLOW. [1855.] Aun. Pform. 98, 247.

Nitrocymol. Nitrocyme

Formation p. 1871.

Preparation. Cymeue which has been cooled by a freezing mixture dropped into fuming nitric acid, likewise carefully cooled, till the

whole has become green and thick; it is then poured into cold water, and the nitrocymene, which is precipitated as a red oil, is washed first with water and then with aqueous carbonate of soda.

Properties. Reddish brown, transparent oil, heavier than water. **Permanent** in the air. Prepared from cymene a (= nitrocymene a) it is bright yellow and lighter than water.

Decompositions. 1. It is decomposed by distillation with water; on the water which distils over there floats a neutral oil which has the properties of cymene a, and is converted into a-nitrocymene by cooled fuming nitric acid.—2. When nitrocymene is added to a paste of iron flings and acetic acid, heat is developed. If the whole be distilled, after the reaction has terminated, a distillate is obtained which, by treatment with hydrochloric acid, is resolved into cymidine, which dissolves, and an insoluble oil, a-cymene.

Nitro-nucleus, C20X2H12.

Binitrocymene.

 $C^{20}H^{12}N^2O^8 = C^{20}X^2H^{12}$.

KRAUT. Ann. Pharm. 92, 70.

Dinitrocymol.

Cymene is cautiously dropped into nitrosulphuric acid as long as it continues to dissolve; the whole is then heated for some time to 50°, and, after standing for two days, is diluted with a large quantity of water, whereupon a brown, slowly solidifying oil is precipitated. On dissolving this oil in boiling alcohol, and leaving the solution to cool, drops of oil are first deposited, and on the removal of these, the liquid yields crystals of binitrocymene by evaporation.

Colourless, rhombic tables. Melts at 54°, and solidifies for the most part at 43°.

					Kraut.
20 C	120		53.57		
2 N					•-
12 H	12		5.36	•••••	5.66
8 O	64	••••	28.57		
C20X2H12	224		100:00		

Dissolves in alcohol and in ether, and is deposited from saturated solutions as an oil.

Oxynitro-nucleus, C20X2H10O2.

Binitranisoin.

 $C_{30}H_{10}N_{5}O_{10} = C_{30}X_{5}H_{10}O_{5}.$

CAHOURS. (1841.) N. Ann. Chim. Phys. 2, 301.

Nitraniside.

Formation and Preparation. 1. Formed when anise-camphor is heated with fuming nitric acid, the reaction being attended with considerable development of heat, and evolution of nitrous fumes; the product, however, cannot be purified, since no solution of it can be made.—2. Asisoïn is dissolved in fuming nitric acid, the solution is precipitated by pouring it into water, and the white pulverulent deposit is thoroughly washed. (Kraut.)

Snow-white, highly electric powder. (Kraut.) Yellow resin, melting at about 100°, and decomposing completely when distilled. Boiled with concentrated caustic alkali, it evolves a large quantity of ammonia, dissolves and forms a black, humus-like acid, viz., melanisic acid, which remains combined with the alkali.

						-	Kraut. at 100°.
20	C	120	 50· 35		52.38		50-91
2	N	23	 11.87	•••••	11.25		
10	H	10	 4.19		4.54	••••	4.49
10	O	80	 33.59	••••	31.83		
(بع	X2H10O2	238	 100.00		100.00		

It gave too much carbon, because it contained anethol (Cahours).

Azo-nucleus, C20N H13.

Cymidine.

 $C^{20}NH^{15} = C^{20}NH^{13},H^2.$

J. Barlow. (1855.) Ann. Pharm. 98, 253. — Notice of results: Phil. May. J. 10, 454; Chem. Gaz. 1855, 319; J. pr. Chem. 66, 341; Chem. Centr. 1856, 48; Instit. 1856, 163.

Formation and Preparation. (Comp. p. 217.) Nitrocymene is added to a thick paste of acetic acid and iron filings, whereby heat is immediately developed. The whole is then distilled (after supersaturation with caustic soda, Kr. b, and a very complicated product is obtained from which the cymidine is extracted by hydrochloric acid. The cymidine, after the portion insoluble in hydrochloric acid has been removed in procipitated from the solution by caustic soda, and extracted with other. On distilling off the other, the product remains in the retort as a brown oil, which is purified by distillation in a stream of hydrogen.

Properties. Yellow, inodorous oil, boiling about 250°, Neutral ter than water.

Decompositions. It is not affected by iodine, and but very slightly by bromine. It is violently attacked and dissolved by nitric acid; soda separates from the solution a semi-solid substance. Becomes slightly warm with chloride of cyanogen, and forms a base, probably homologous with melaniline. This is precipitated by adding caustic soda to the solution obtained by boiling the mass with water. With chloride of benzoyl, it forms with evolution of heat, crystals, probably consisting of benzoylcymidide.

Combinations. Cymidine dissolves sparingly in water, and forms salts with acids.

Sulphate of Cymidine. White crystalline salt, soluble in water.

Hydrochlorate of Cymidine. Strong hydrochloric acid forms with cymidine white clouds and an oil lighter than water, which solidifies in crystals by evaporation or agitation. Turns pinewood yellow. Its solution dyes the skin red. It is not coloured by chloride of lime. Contains 19:68 p. c. HCl, corresponding to the formula C28NH16,HCl (by calculation = 19:72 p. c. HCl.

With terchloride of gold, cymidine forms a yellow, crystalline salt,

sparingly soluble in water.

Chloroplatinate of Cymidine. Aqueous solution of hydrochlorate of cymidine yields with platinic chloride a yellow precipitate which dissolves sparingly in water, but abundantly in alcohol and especially in ether.

					Barlow.
20 C	120.0		33.78	*******	33.77
N	14.0	****	3.94		
16 H	16.0	****	4.51		4.67
Pt	98.7	****	27.79	*******	27.64
3 Cl	106.5		29.98		
C20N L116C1 D+C12	255.9		100:00		

Prepared from a- nitrocymene (= chloroplatinate of a- cymidine), it contains 27.66 p. c. Pt.

Oxalate of Cymidine. White, crystalline salt, insoluble in water. Cymidine dissolves readily in alcohol and in ether.

Azo-nucleus C20N2H12.

Nicotine.

$C^{20}N^2H^{14} = C^{20}N^2H^{12}H^2$

Posselt & Reimann. Mag. Pharm. 24, 3138; further, 15, 2, 57; presented as a prize essay to the Medical Faculty of Heidelberg, in 1828.

O. HENRY & BOUTRON-CHARLARD, J. Pharm. 22, 689; J. pr. Chem. 10, 208.

LIEBIG & GAIL. Ann. Pharm. 18, 66.

ORTIGOSA. Ann. Pharm. 41, 114.

BARRAL. Compt. rend. 14, 224; in detail, N. Ann. Chim. Phys. 7, 151; J. pr. Chem. 26, 49; Ann. Pharm. 44, 281. — Compt. rend. 24, 218; J. pr. Chem. 41, 466; more fully, N. Ann. Chim. Phys. 20, 345.
 MELSENS. N. Ann. Chim. Phys. 9, 465; Ann. Pharm. 49, 353; J. pr. Chem. 32, 372.

v. Planta-Reichenau. Dissert. über das Verhalten der wichtigsten

Alkaloide gegen Reagentien. Heidelberg, 1846.

Schlössing. Compt. rend. 23, 1142; J. pr. Chem. 40, 184; more fully, N. Ann. Chim. Phys. 19, 230.

RAEWSKY. N. Ann. Chim. Phys. 25, 322; J. pr. Chem. 46, 470; abstr.

Ann. Pharm. 70, 232.

J. BÖDEKER. Ann. Pharm. 73, 372.

v. Planta & Kekulé. Ann. Pharm. 87, 1. Stahlschmidt. Ann. Pharm. 90, 218; J. pr. Chem. 63, 89; Pharm. Centr. 1854, 680.

Otto. Anleitung zur Ausmittlung der Gifte. Braunschweig, 1856, 87.

Vauquelin (Ann. Chim. 71, 139), in 1809, was the first to make experiments with the view of isolating the acrid principle of tobacco; he discovered the volatility of the nicotine compounds and their behaviour with potash, but did not succeed in isolating the alkaloid. In this, Posselt and Reimann succeeded in 1828; Ortigosa, in 1842, analysed the compounds of nicotine, and Barral analysed nicotine itself. E. Davy (Ann. Pharm. 18, 63), described as aqueous nicotine the ammoniacal liquid obtained by the distillation of tobacco or tobacco-roots with solution of potash, being unacquainted with pure nicotine; his nicotine-salts were mixtures of these and ammonia-salts. (Instit. 1835, 137; Ann. Pharm. 18, 63; J. pr. Chem. 7, 90; J. Pharm. 22, 18.)

Formation. The dried substance of rotten potatoes distilled with caustic lime yields nicotine, recognisable by its odour. (7 Kr.) (Winkler, Jahrb. pr. Pharm. 25, 82.)

Sources. In Nicotiana Tabacum, rustica, macrophylla and glutinosa, in combination with malic acid. (Posselt & Reimann.) — As a salt. (Schlössing.) — Nicotine exists ready formed in tobacco, and is not formed in its preparation. (Henry & Boutron, Schlössing.) It can be as effectually separated by magnesia as by alkalis (Henry & Boutron), also by lime, baryta and ammonia. (Schlössing.) Acrid vapours are evolved from a boiling infusion of tobacco by carbonate or bicarbonate of potash; the presence of nicotine in these vapours may be detected by mercuric chloride. Carbonate of lime produces the same effect, but to a less extent. (Schlössing.) - Also when tobacco is distilled without alkali, nicotine passes over, though in smaller quantity. (Henry & Boutron.) When an aqueous or alcoholic infusion of tobacco is too rapidly evaporated down, strong vapours of nicotine are evolved. (Schlössing.) When unfermented tobacco is extracted with ether, the solution evaporated, and the residue heated, an odour of nicotine is perceived. (Only a small portion, however, of the nicotine is thus extracted.) Alcohol entirely removes the acrid qualities of tobacco; the alcoholic extract precipitated with mercuric chloride gives the double salt of nicotine and mercury. (Schlössing.) If fresh tobacco-juice be precipitated with tannic acid, the precipitate decomposed at a gentle heat by

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excess of acetate of lead, the liquid then filtered, the filtrate freed from ead by dilute sulphuric acid, evaporated to dryness, mixed with carbonate of lime and perfectly dried, a large quantity of nicotine may be extracted from the residue by ether. (Henry & Boutron.) Melsens supposed that nicotine was a product of the fermentation or of the imperfect com-

bustion of tobacco. (N. Ann. Chim. Phys. 9, 471.)

The following are the percentages of nicotine in different sorts of dry tobacco leaves, deprived of their ribs. a. French tobaccos of the Departments: — Lot, 7.96; Lot et Garonne, 7.34; Nord, 6.58; Ile et Vilaine, 6.29; Pas-de-Calais, 4.94; Alsace, 3.21 p. c. — b. American tobaccos: — Virginian, 6.87; Kentucky, 6.09; Maryland, 2.29; Havanna under 2 p. c. (Schlössing.) — Four kinds of Paraguay tobaccos contained 1.8; 2; 5.5 and 6 p. c. nicotine. (Lenoble, N. J. Pharm. 22, 30; Lieb. Kopp. Jahresb. 1852, 531.) When tobacco leaves are prepared for snuff, nicotine is lost in the fermentation (Henry & Boutron), to the amount of about 3rds, so that 100 pts. dry snuff still contain about 1.36 p. c. nicotine, chiefly as acetate which is soluble in ether. (Schlössing, N. Ann. Chim. Phys. 19, 246.) Tobacco-smoke contains nicotine which, when long porcelain pipes are smoked, is found in the juice collected in the bowl. (Melsens.) By the dry distillation of tobacco, Unverdorben obtained (Pogg. 8, 399), among other products, a base which, on being dissolved in water and boiled down with dilute sulphuric acid, was decomposed into ammonia, fuscine, and odorine (xi, 263). See also xiv, 234; Empyreumatic oil of tobacco.

Preparation. 1. Coarsely powdered tobacco is boiled with water; the liquid, after filtration through linen, is evaporated to the consistence of extract; and before it has completely cooled, it is shaken up with 2 vols. alcohol of 36°. On standing, the semi-fluid mass divides into two strata, the lower, which is black and almost solid, consisting chiefly of malate of lime, while the upper forms a black solution containing all the nicotine. This is decanted; the alcohol is distilled off; the residual extract again precipitated with alcohol; the alcoholic solution again evaporated; and the residue mixed, before it is quite cold, with concentrated potash-ley, whereupon heat is developed. After cooling, the whole is shaken with ether, which takes up nicotine and other substances, thereby acquiring a deep yellow colour. On distilling the othereal solution, nicotine tolerably colourless passes over at 180°, but frequently contaminated with decomposition-products of the other substances; hence it is more advantageous to proceed as follows: To the ethereal solution, powdered oxalic acid is gradually added, the whole being continually shaken, whereby, when the ether is not too aqueous, a white precipitate of oxalate of nicotine is immediately produced, which afterwards deliquesces to a syrup at the bottom of the vessel. The liquid is decanted; the precipitated syrup washed with ether, and decomposed by potash; the liberated nicotine is taken up by ether; the ethereal solution heated on a water-bath to expel ether, water, and ammonia; and the temperature then gradually raised, and kept for a whole day at 140°, while a stream of hydrogen is passed through the liquid. The product is now heated to 180°, whereupon colourless nicotine passes over. 1000 grammes of tobacco from Lot yield from 50 to 60 grammes of nicotine. (Schlössing.) Posselt & Reimann adopted a similar process. (Vid. infra.)

2. Bad tobacco or tobacco-dust is macerated for 24 hours with water

to which 1 p. c. of sulphuric or hydrochloric acid has been added; and

the expression of the strate rate in the consistence of syrup, and distilled with about its of the true of strang persected in water being added as the action of the control of interior arms of a and microtine, is that the control of the fill of the treatments.

The first late of extrated with interiors of caustic potash, which

7. The dethate Assistanted with impreents if caustic potash, which discusses developing at the insulation and expelling most of the amounts, while the tile time is equal to as an olly stratum. This is described and freely a gettle heat from altering ammonia. (Liebig & Co.)

Gal.

3. The instillate is neutralised with walls acid and evaporated to degrees; the include of mouther is extracted from the residue by boiling alcounts and the solution evaporated to the consistence of syrup, and chaken in stoppered bottles with fragments of potash and other. By repeting this treatment the while of the nicotine is obtained dissolved in the other. On distributing the othereal solution in a water-bath, pure and aqueous ether other containing alcouire, and finally colouriess oily alcouire, which is collected apart pass over in succession. The nicotine still contains water.

On loose

still contains water. Ortigisa.

3. Finely cut Alsatian to bacco is digested with water containing sulphuric acid, pressed out after three days, and the residue submitted to the same treatment till it has entirely lost its acrid taste. The liquid is evaporated to half its bulk, and distilled with lime; the distillate is next shaken with ether, which takes up most of the nicotine, then poured back into the retort and again distilled. The distillate is again treated with ether; poured back into the retort, after the ethereal layer has been decanted, and so on, till the residue no longer has any acrid taste. The brown ethereal solution is gradually heated to 140° within 14 days, whereby ether, water, and other bodies more volatile than nicotine are driven off, then mixed with siaked lime, and heated to 190° in a stream of hydrogen; and the slightly coloured nicotine which passes over it collected as much as possible out of contact of air, and rectified.

4. From the so-called Tota co mordant (Tabaksbeize). The brown liquid, mixed with a slight excess of sulphuric acid, is evaporated to a syrup, and mixed with a slight excess of potash-ley; the liberated nicotine in taken up by ether; the ethereal solution mixed with oxalic acid; and the resulting precipitate of oxalate of nicotine decomposed by potash-ley. By shaking up the potash-solution with ether, the nicotine is again dissolved, and may be obtained pure by distilling off the ether, and rectifying per se.

Molsens purifies the nicotine thus obtained by placing it in contact with potassium till the metal is no longer attacked even on heating the liquid, and then distils the brown liquid over caustic baryta in a stream of hydrogen; the purest portion passes over towards the middle of the distillation.

Older proces.es. — Tobacco is distilled with water and 1's potash-hydrate is sody-hydrate and 12 pts. water, according to Henry & Boutron); the residue is mixed with thrice its bulk of water and reditilled; the united distillates containing tobacco-camphor (p. 232), nicoting and carbonate of ammonia, are neutralised with sulphuric acid, and evaporated nearly to dryness; and the sulphate of nicotine is extracted from the residue by absolute alcohol. The alcoholic solution is evaporated;

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the residue is shaken up with aqueous potash; and the liberated nicotine is taken up by ether; on distilling off the ether, the nicotine remains behind, amounting to \$\frac{1}{0\frac{1}{00}}\$ of the tobacco. (Posselt & Reimann.) Henry & Boutron distil the sulphate of nicotine with hydrate of soda, and free it from ammonia by leaving it in vacuo. — Posselt & Reimann likewise exhaust the decoction prepared with water containing sulphuric acid and evaporated with alcohol of 90 per cent.; distil off the alcohol; decompose the residue with hydrate of lime or magnesia; and separate the nicotine from it by distillation and agitation with ether, like Schlössing. They dehydrate the ether containing nicotine with chloride of calcium, and expel the ether in the water-bath. The nicotine thus prepared contains a trace of chloride of calcium.

Estimation of Nicotine in Tobacco. — 10 grammes of tobacco containing a known amount of water are introduced into a glass tube, the lower end of which, contracted and bent at right angles, is inserted into the lateral aperture of a flask holding to of a litre; the tobacco is moistened with a quantity of ammonia sufficient to liberate all the nicotine; ether is poured into the flask; and its neck is closed with a glass tube which conveys the vapours into a Liebig's condensing apparatus. The lower extremity of this condenser is bent, and fitted by means of a cork into the glass tube containing the tobacco, so that the ether volatilised by the boiling, and again condensed by the cooling apparatus, passes through the tobacco, drops into the flask loaded with nicotine, is again volatilised, and again made available for exhausting the tobacco. The apparatus thus arranged is heated for 2 to 4 hours, or till a few drops of the ether which run off from the tobacco no longer leave any nicotine when evaporated at a gentle heat; the tube containing the tobacco is then replaced by a receiver; the lateral tabulus of the flask is closed; and the liquid is distilled till the ethereal vapours, which at first are strongly ammoniacal, no longer contain any ammonia, and are likewise free from nicotine. The remainder of the ether is left to evaporate in the air, and the quantity of nicotine remaining (from which resin separates) is estimated by the amount of sulphuric acid of known strength required to neutralise it. — 49 pts. of oil of vitriol (SO4H) correspond to 192 pts. of nicotine. (Schlössing.) Schiel (Ann. Pharm. 105, 257; J. pr. Chem. 74, 127).

Processes for the detection of nicotine in cases of poisoning are given by Stas (Bull. de l'Acad. de Médecine de Belgique, 9, 304; Jahrb. pr. Pharm. 24, 313; Ann. Pharm. 84, 379; Liebig & Kopp's Jahresber. 1851, 640); further: Orfila (J. Chim. méd. 27, 399). See also Lehmann (Pharm. Centr. 1853, 927); Melsens (Bull. de l'Acad. de Médecine de Belgique [2], 1, No. 9; Rep. Chim. pure, 1, 232).

Properties. Colourless, transparent oil which remains liquid at — 6° (Posselt & Reimann), at — 10° (Barral), and when heated, even to temperatures short of 100°, gives off white vapours having an intolerable odour. (Ortigosa.) — When nicotine is left in a vacuum for a few days, small crystals appear in it which resemble chlorate of potash, and deliquesce rapidly in the air. (Henry & Boutron.) It distils very slowly at 146°, begins to boil at 240° (towards 250°, according to Barral,) only a portion, however, distilling colourless and undecomposed, in heavy white fumes (Posselt & Reimann, vid. inf.) — Sp. gr. 1.048 (Henry & Boutron); 1.033 at 4°; 1.027 at 15°; 1.018 at 30°; 1.0006 at 50°; 0.9424 at 101.5°. (Barral.) It has a sharp odour, slightly resembling that of tobacco (Barral), un-

pleasantly pungent, like that of dry tobacco, especially when heated (Posselt & Reimann): has a strong odour, unpleasantly like that of tobacco (Ortigosa): slightly ethereal. (Otto.) — Taste burning. (Barral.) Even when diluted, it has an extremely sharp and caustic taste, producing choking in the throat. (Henry & Boutron.) — It is poisonous, 4 of a drop being sufficient to kill a rabbit, and one drop being a fatal dose for a dog. (Posselt & Reimann.) — 5 milligrammes placed upon the tongue of a middle-sized dog kill it in 3 minutes. 4 of a grain dropped into the eye of a full-grown cat produces contraction of the pupil and strong narcotic symptoms, which, however, pass off in the course of an hour. (Gergis & Hesse, Ann. Phorm. 7, 203.) Small birds are killed even by the approach of a glass rod moistened with nicotine. Very weak aqueous nicotine taken into the mouth, even for a second, produces heavy turpidity, lasting for 10 minutes, then a sensation of heaviness and head-ache lasting for several hours. (Henry & Boutron, comp. Melsens, Ann. Chim. Phys. 9, 468.)

Nicotine has a strong aikaline reaction. — Its vapour-density is 5:829: or, taking into account the 3 per cent of residue left in the distillation, it is 5:607. (Barral.) It turns the plane of polarisation of a luminous ray strongly to the left. (Laurent, Compt. rend. 19, 926; Wilhelmy Pogg. 81, 527.) — Meat keeps for any length of time in nicotine vapour, merely assuming a brighter red colour. (Robin, Compt. rend. 32, 177.)

2 N	120	17:28	73·69 17·04	74·3 17·3	17:11
C ₂ (N ₂ H ₁₃	162 .	100-00	59 59	100.4	99·4
	C-vapour N-gas H-gas		8		
	Ni. otine-vapo		11.		-

Ortigosa, from his analysis of the plantage sult, assigned to nicotine the formula CPNH, which was adopted by Profile Milsons proposed the formula CPNH, and Barral, after recalculating his lower analysis, showed that this formula was in accordance with it; he, moreover, doubled at to agree with the vapour-density, a conclusion to which Schlössin, was also help yells determination of the saturating power of nicotine towards sulphenic and.

Decompositions. 1 Nicotine quickly assumes a brownish yellow colour when exposed to light. Henry & Bonastro.) — 2. When distilled, even in an atmosphere of earl onic held, it always leaves a small residue amounting to about 3 per cent, this effect being reproduced every time distillation is repeated. Negligible conversion and the residue, which is insoluble in water, but easily soluble in about a page is to be an isolate modification of nicessal. (Barrall) Nicotine when distillation as a tissue shade in about and precipitate thereform by water. Outlied: The solutions is said to in about and precipitate evaporate in the large. Pass to Region — 3. Nicotine exposed for some time to the viv. turns brown, becames more vised, and is partly converted into a resin. (Posselt X.) eigener, Barrall and others.) 4. At ordinary tensaries, it is not set on the by the approach of a flaming body, but burns

225 NICOTINE.

in a wick with a bright smoky flame. (Posselt & Reimann.) The vapour which rises from nicotine heated in a crucible may be set on fire.

(Henry & Boutron.)
5. Warm oil of vitriol does not act immediately on nicotine, but gradually acquires a red-brown colour by contact with it; the solution supersaturated with hydrate of soda, yields nicotine free from ammonia. (Henry & Boutron.) Boiling oil of vitriol decomposes nicotine completely (leaving a black thick mass, according to Stahlschmidt), so that the liquid neutralised with ammonia tastes no longer sharp but only bitter. (Posselt & Reimann.)

6. Aqueous nicotine mixed with tincture of iodine, (or with aqueous hydriodous acid or hydriodite of potash mixed with chlorine), becomes turbid, and yellowish at first, but afterwards crimson, even when diluted 1000 times (Posselt & Reimann); according to Planta, it produces with tincture of iodine, a kermes-brown precipitate. On mixing the ethereal solutions of iodine and nicotine, heat is evolved, and after a while the mixture solidifies to a crystalline pulp of teriodonicotine. (Wertheim, Gerhardt's

Traité, 4, 193.)
7. When nicotine is dropped into a bottle filled with chlorine gas, a violent action takes place, sometimes attended with emission of light; hydrochloric acid gas is evolved; and the nicotine becomes blood-red, but loses its colour again by exposure to light for a few days, and then at a rather low temperature (below 8°) deposits long needles, which however melt at a slightly elevated temperature. The liquid, which has become colourless by exposure to light, deposits when mixed with water, a white sediment, which may be recrystallised from alcohol, the supernatant very acid liquid becoming red-brown when evaporated at a gentle heat. (Barral.) - When chlorine is passed over nicotine, a dark brown solid substance is obtained, which dissolves readily in alcohol but does not separate in the crystalline form on evaporation. (Stahlschmidt.) -Chlorine-water does not act on nicotine in the cold; if the liquid be heated at the same time, it turns yellow, without giving off nitrogen gas. (Henry & Boutron, Barral.) — Aqueous hypochlorous acid added to a concentrated aqueous solution of nicotine, produces a whitish turbidity, without evolution of nitrogen gas, which however takes place immediately on adding a small quantity of ammonia. (Henry & Boutron.) Nicotine is quickly decomposed by aqueous perchloric acid. (Bödeker, Ann. Pharm. 71, 64.) By the action of chlorine on hydrochlorate of nicotine, a beautifully crystallised compound is formed, easily soluble in water, insoluble in alcohol. (Geuther & Hofacker, Ann. Pharm. 108, 35.)

8. Nicotine heated with nitric acid, gives off copious red fumes, and if distilled with potash after the reaction is finished, yields a volatile base which appears to be ethylamine. (Anderson, Ann. Pharm. 75, 82.) — With hot nitric acid, it gives off nitrogen gas and yields a thick orangecoloured mass without any oxalic acid. (Henry & Boutron.) With nitric acid or acid chromate of potash and sulphuric acid, nicotine gives off a suffocating vapour and forms a brown liquid. (Stahlschmidt.) — Fuming nitric acid attacks it violently, even in the cold, but does not

decompose it completely. (Posselt & Reimann.)

9. Hydrate of soda exerts a decomposing action upon nicotine, eliminating a small quantity of ammonia. (Henry & Boutron.) When nicotine containing water is left in contact with lumps of hydrate of potash, it dissolves potash, and yields by distillation a liquid which has an odour different from that of nicotine, contains 52 per cent, of carbon, does not form chloroplatinate of nicotine when mixed with bichloride of platinum, but yields by evaporation of the mixed alcoholic solution,

crystals easily soluble in alcohol. (Ortigosa, comp. p. 223.)

10. When cyanogen gas is passed over nicotine (Stahlschmidt), or into the alcoholic solution (Hofmann), a brown product is formed which does not crystallise from alcohol (Stahlschmidt) and does not exhibit basic properties. (Hofmann, Ann. Pharm. 66, 145.)

11. It acts upon cyanate of ethyl less quickly than aniline, forming a compound which crystallises in beautiful lamine. (Wurtz, Compt. rend.

32, 418; Ann. Pharm. 80, 349.)

12. In contact with iodide of methyl, it deposits a heavy brown oil, and solidifies on cooling as crystalline hydriodate of methyl nicotine. (Stahlschmidt, Ann. Pharm. 90, 222.) — In contact with iodide of ethyl, it is converted, even at ordinary temperatures, more quickly at 100°, into hydriodate of ethyl-nicotine. (v. Planta & Kekulé, Ann. Pharm. 87, 3.) When iodide of amyl is heated for several days with nicotine in a scaled tube, a brown syrup is obtained, which does not solidify, even when cooled and exposed to the air, or crystallise when its aqueous or nlcoholic solution is left to evaporate, but when treated with water deposits the excess of iodide of amyl and yields a solution of hydriodate of amyl-nicotine (Stahlschmidt.)

Combinations. With Water. A. Hydrated Nicotine. Nicotine exposed to moist air quickly takes up water, to the amount of 10 per cent in a day, but gives it up again completely in a dry current of ga. (Schlössing.) In an air-space saturated with aqueous vapour, nicotine takes up, in the course of three weeks, 1.77 per cent. of water, which, however, is given off again when the hydrated nicotine is placed over hydrate of potash. Nicotine thus saturated with water solidifies completely in a freezing mixture of ice and salt. (Barral.)

B. Aqueous Nicotine. Nicotine dissolves in water in all proportions. (Posselt & Reimann, Barral and others.) With half its volume or less if water, it forms (when it contains resinous matter, according to Posselt & Reimann) a clear mixture which is rendered turbid by a larger addition of water. (Ortigosa.) Hydrate of potash separates nicotine from its

aqueous solution. (Liebig & Gail.)

Nicotine at 100° dissolves 10°53 p.c. sulphur, the greater part of which crystallises out on cooling, the nicotine returning a dark brown colour. — It does not dissolve phosphorus. (Barral.) It absorbs ammonia gas but does not retain it more firmly than it retains water.

(Schlössing.)

With Acids. Nicotine saturates acids completely. The salts of micotine crystallise sometimes in laminar, sometimes in granular form. (Henry & Boutron.) The simple salts crystallise with difficulty, the double salts more easily. (Barral.) They have a very sharp taste. (Henry & Boutron.) Their aqueous solutions may be evaporated at a gentle heat without much loss of nicotine. (Posselt & Reimann.) They give off part of their nicotine when evaporated. (Henry & Boutron.) They emit the odour of nicotine when treated with potash-ley, and product with iodine the kermes-colour of nicotine. (Posselt & Reimann.) They dissolve rendily in alcohol of 40° (Henry & Boutron.) but are insoluble in ether, with the exception of the acetate. (Schlössing.) Nicotine precipitates the salts of manganese, zinc, lead, iron, (ride tafr.) and tartatemetic, like the alkalis. (Henry & Boutron.) It precipitates the salts

of manganese and iron in the cold, silver-salts when heated. (Schlössing.) It likewise precipitates acetate of lead, acetate of copper, and chloride of cobalt. (Otto.) It does not precipitate baryta or lime-salts, but when carbonic acid gas is passed into an aqueous mixture of nicotine mixed with excess of nitrate of lime or chloride of barium, a precipitate of carbonate of lime or carbonate of baryta is formed in the proportion of 1 at. to 1 at. of the nicotine used. (Schlössing.)

 $CaO,NO^5 + C^{20}N^2H^{14} + HO,CO^2 = C^{20}N^2H^{14},HO,NO^5 + CaO,CO^2$

Phosphate of Nicotine. The colourless syrup obtained by neutralising nicotine with aqueous phosphoric acid, yields by evaporation in sunshine, white crystals resembling cholesterin. (Posselt & Reimann.) — Nacreous laminæ. (Henry & Boutron.)

Sulphate of Nicotine. — 100 parts of oil of vitriol neutralise on the average 329.7 pts. of nicotine, forming neutral sulphate of nicotine, C²⁰N²H¹⁴,HO,SO³. (Schlössing.) (Calculation 330.6 pts.) The sulphate is a brown uncrystallisable syrup. (Posselt & Reimann.) Nacreous laminæ. (Henry & Boutron.)

Acid Iodate of Nicotine is nearly insoluble in alcohol. (Henry & Boutron.)

Hydrachlorate of Nicotine. — Nacreous lamine. (Henry & Boutron.) Obtained by saturating nicotine with dry hydrochloric acid gas, and leaving the product in vacuo, in long deliquescent white threads, which are more volatile than nicotine, and dissolve readily in water and alcohol, not in ether. (Barral.) When dry hydrochloric acid gas is passed over gently heated nicotine, and the excess of hydrochloric acid is expelled by means of dry hydrogen gas, quantities of hydrochloric acid are taken up, varying from 1 to 2 At., but a considerable portion goes off on gently heating the product. The alcoholic solution of the salt deflects the plane of polarisation of a ray of light to the left. (Pogg. 81, 527.)

			Barral.
2 HCl			 29.74
C20N2H14,2HC1	235	 100.00	

Nitrate of Nicotine crystallises with difficulty. (Henry & Boutron.)
Aqueous nicotine forms with phosphate of magnesia a gelatinous precipitate; with acid sulphate of alumina, needle-shaped crystals of a double salt. (Henry & Boutron.) With phospho-molybdic acid, it behaves like conine (xiii, 164; Sonnenschein, Ann. Pharm. 104, 47.)—Phosphantimonic acid (produced by dropping pentachloride of antimony into aqueous phosphoric acid) added to an aqueous solution containing \(\frac{1}{25.0} \) pt. of nicotine, produces a slight turbidity. (F. Schulze, Ann. Pharm. 109, 179.)

Chloride of Cadmium with Hydrochlorate of Nicotine. Nicotine forms with chloride of cadmium, a compound which is difficult to crystallise (G. Williams, Chem. Gaz. 1855, 450; Chem. Centr. 1856, 47), dissolves Q 2

really a wave been not give it any water in 100°, and corresponds to the Senina FFFE-1HTISSUEL Galedy, N. Estab. n. Phil J. 4, 14. Then water 1808–1808.

For presenting the large of the with abstrine, a white double salt is identified. Button, with the second of section a vellow-brown double salt. Button, a track-rest presenting Henry & Bourson). With sulphate of magnetic appreciase produces a greenish white precipitate, which is not turned these of massives by excess of nicotine. Henry & Boutron)

Honor out Mercure India. CNNHaRHaI. Colourless lamins, thusined by inturning meetine with mercuric fieldle (whereby heat is everyth and a portion of the nicotine consequently volatilised) and boiling the mass with water. Wembelm. Gerhard's Traité, 4, 192.)

I'd description Marriera — A solution of mercuric iodide in hydrodic actions in the interior hydrodicate of nicotine till the precipitate formed on each addition begins to be remainent; the double salt then crystallies from the solution after standing for some time. The mother-liquor is decomposed by suppration. Small velocity prisms sparingly soluble in cold water and in aboth. It is decomposed by hot water, depositing a reddish yellow resin insoluble in potasticley. (B. deker.) Hydrochlorate of nicotine added to potassio-mercuric iodide, produces a yellowish white precipitate insoluble in hydrochloric acid. (v. Planta.)

NºH-4,2HI - 2HgI	872		100.00		
H <u>z</u>	. 200	••••	23.07	•••••	22.71
I	503		57.84		58:33
Ca.N:H:a	164		19-09		
					Büdeker

Nicotine with Mercuric Chloride. — Pure nicotine and acetate of nicotine form with solution of mercuric chloride, white flocks, easily soluble in hydrochloric acid, insoluble in alcohol. Posselt & Reimann.) Hydrochlorate of nicotine, throws down from corrosive sublimate, a white pulverulent precipitate easily soluble in hydrochloric acid and in sal-ammeniae. v. Plauta.

a. With 2 at. Mercuric Chloride. — By precipitating a solution of corrosive sublimate with aqueous nicotine. White crystalline precipitate which melts and turns yellowish below 100°.

Insoluble in water and ether, sparingly soluble in alcohol. (Ortigona)

				(Prtigusa.
20 C	120	••••	27.72		27.70
2 N	28		6.46		
14 H	14		3.23		3.73
2 Cl	71		16.40	•••••	15.86
2 Hg	200		46.19		45.53

b. With 6 At. Mercuric Chloride. A solution of nicotine in dilute hydrochloric acid is dropped into a saturated solution of mercuric chloride, as long as the precipitate at first produced redissolves, and the solution is a saide for a few days, whereupon, if it is sufficiently diluted, the country and separates in crystals. If the solution is too strong, an oil is pre-

Dissolves sparingly in cold water and melts to a brown resin in hot water. Dissolves in acidulated water, sparingly in cold alcohol.

(Bädeker.)

				E	Bödeker.
C20N2H14	162		16.9		
6 Cl	213		21.7		21.6
6 Hg	600	****	61.4	********	61.9
C20N2H14,6HgCl	975		100.0		

Chloromercurate of Nicotine, With 8.4t. Mercuric Chloride, C²⁰N²H¹⁴,HCl,8HgCl.—Obtained as a crystalline precipitate by treating a cold neutral solution of hydrochlorate of nicotine with a larger excess of aqueous chloride of mercury. Crystallises from hot water in stellate groups of needles. (Th. Wertheim, Gerhardt's Traité, 4, 191.)

Aqueous nicotine does not precipitate cyanide of mercury. (Henry

& Boutron.)

Nicotine with Mercuric Chloride and Cyanide. A neutral solution of hydrochlorate of nicotine is mixed with an equal quantity of a saturated solution of cyanide of mercury. Colourless silky prisms grouped in tufts, dissolving easily and without decomposition in water and alcohol, both cold and hot. With hydrochloric acid, it evolves hydrocyanic acid Potash-ley does not precipitate the solution of the prisms, but colours the solid salt reddish yellow. Contains 60.85 p. c. mercury, 17.76 chlorine, and 2.46 cyanogen, and is therefore probably C²⁰N²H¹⁴,5HgCl,HgCy or C²⁰N²H¹⁴,4HgCl,2HgCy. (Bödeker.)

Nicotine with Nitrate of Silver. — Aqueous nicotine does not precipitate nitrate of silver. (Henry & Boutron) a. With \(\frac{1}{2}\) At. Nitrate of silver, 2C\(^{20}\)N\(^2\)H\(^{14}\),AgO,NO\(^5\). When alcoholic nitrate of silver is mixed with excess of alcoholic nicotine, and the dilute solution left to evaporate, beautiful prisms are produced, which appear to belong to the oblique prismatic system. (Wertheim.)

b. With 1 At. Nitrate of Silver, C²⁰N²H¹⁴, AgO, NO⁵. Obtained like α, but with excess of nitrate of silver. Colourless prisms.

Nicotine with Terchloride of Gold — Aqueous nicotine forms with sodio-auric chloride a light orange-coloured precipitate. (Henry & Boutron.) Hydrochlorate of nicotine added to auric chloride, throws down light yellow flocks, insoluble or sparingly soluble in hydrochloric acid. (v. Planta.)

Chloroplatinite of Nicotine. — a. With 2 At. Hydrochloric acid.

1. Nicotine is gradually added to a luke-warm solution of protochloride

of platinum in hydrochloric acid, stirring constantly and cooling the liquid, because it is apt to get heated. There is then produced a crystalline precipitate of orange-coloured chloroplatinite of nicotine with 4 At hydrochloric acid, the quantity increasing as the stirring is continued; and the mother-liquor filtered from this precipitate yields by evaporation or cooling, red-coloured right prisms of chloroplatinite of nicotine with 2 At. hydrochloric acid. — 2. This salt is obtained in larger crystals, when the content of the property of the content of the co when the orange-coloured salt is redissolved in the mother-liquor by boiling, and the solution is left to cool and crystallise in vacuo. -3. When the red prisms obtained by 1 or 2 are dissolved in a large quantity of hot water, the solution becomes turbid on cooling, from separation of yellow crystalline scales, isomeric with the red prisms obtained by 1 or 2. (Raewsky.)

Leaves platinum when ignited on platinum-foil. With hot nitric acid it gives off red vapours. It is turned brown by oil of vitriol, and when heated yields a brown precipitate and gives off sulphurous acid. It dissolves sparingly in cold water, more easily in hot water (if heated with two little water, it becomes gelatinous on the surface and less soluble), and separates on cooling in yellow crystalline scales, isomeric with the red prisms. It dissolves in cold nitric and hydrochloric acid, not in alcohol or in ether.

(Raewsky.)

	Red sale	t.			a.		newsky.
20 C	120.0	****	23.8	******	24.00	Septem .	24-1
2 N	28.0	****	5.6		5.20		6.1
16 H	16:0	****	3.2		3-25		3.2
2 Pt	197-4	****	39-2	SHIPPS.	39-40		
4 Cl							
C20N2H14,2HC1,2PtCl	503.4	***	100.0	*******	100-00	4400	100-0

a. Red prisms. b. Yellow crystalline scales. According to Raewsky, it is PtCl₂Cl⁰NH⁷, HCl₂, that is to say, the hydrochlarate of a peculiar platinum base (the corresponding member to which among the amountable). with respect to this and the following compound (Compt. chim. 1849, 206), inserts as the latter gives off nicotine when treated with potash.

b. With 4 At. Hydrochloric acid. - (Preparation, vid. sup.). Orange yellow crystalline powder (a); separates by spontaneous evaporation from its solution in hydrochloric acid, in very large, regular, oraccoloured rhombic prisms (b); from its solution in nitric acid in small yellow crystals (c). When dissolved in (an insufficient quantity of) boiling water, it leaves an amorphous residue (d), whilst the salt a crystallises from the solution. (Raewsky.)

Heated on platinum-foil, it swells up, gives off hydrochlorate of nicotine, burns like tinder, and leaves platinum. Cold oil of vitriol turns it white; hot oil of vitriol chars it, with evolution of sulphurous acid, and leaves a black residue of platinum. With potash, it evolves nice-

tine. (Raewsky.)

Insoluble in cold water, (vide sup.) Insoluble in alcohol and other. Dissolves in nicotine, forming a red liquid, miscible without turbiday with cold water; and on evaporating this solution in vacuo, there remains a thick, glutinous, very deliquescent mass, resembling treacle, which dissolves in water, bydrochloric acid, nitric acid, alcohol and other, and cannot in any way be made to crystallise, (Raewsky.) Perhaps C²⁰N²H¹⁴,2HCl,PtCl or C²⁰N²H¹⁴,HCl,PtCl. (Gerhardt, Compt. chim. 1849, 206.)

					Raewsky.						
Orange-y	ellow s	alt.			a. mean.		b.		c.		d.
20 C					20.5		20.7	****	20.4	****	20.5
2 N	28.0		4.9		6.2		4.9	*****	6.2		6.2
18 H	18.0		3.1	*******	3.2	****			3.4		
2 Pt	197.4	2646	34:3	-	34.2	4316	34.3		34.0	****	34.0
6 C1	213.0	***	36.9								
C20N2H14,4HC1,2PtC1	576.4		100.0	********	100.0		100-0		100.2		100.0

According to Raewsky, PtClC10NH7,2HCl (comp. p. 230.)

Chloroplatinate of Nicotine. — Nicotinplatinchlorid. — On mixing the solutions of hydrochlorate of nicotine and bichloride of platinum, a yellow crystalline precipitate is formed if the solutions are concentrated, and if they are dilute, there are deposited, after a while, oblique four-sided prisms belonging to the right prismatic system. (Ortigosa.) Barral obtains the same compound as a granular powder by precipitating bichloride of platinum with nicotine. Liebig & Gail precipitate with bichloride of platinum the distillate containing nicotine and ammonia obtained in the preparation of nicotine, as described at page 222, whereupon the liquid filtered from the precipitate of chloroplatinate of ammonium deposits, after three or four days, large ruby-red crystals. — The salt has a bitter and very sharp taste. (Posselt & Reimann.)

When exposed to the air, it becomes dull, and cannot be recrystallised without decomposition. Distilled with potash-ley, it yields pure nicotine. (Liebig & Gail.) It dissolves with difficulty in water. (Ortigosa.) Soluble in boiling water. (Barral.) It dissolves in hot dilate hydrochloric acid (Ortigosa), somewhat in nitric acid. (Posselt & Reimann.) Insoluble in hydrochloric acid. (v. Planta.) Insoluble in alcohol and in ether (Ortigosa); very soluble in a slight excess of nicotine. (Barral.)

						Ortigosa	Barral.
20	C	 120.0	2444	20.87	wishing	20.98	 21.12
16	H	 16-0		2.78	*******	3.09	 3.16
2	Pt	 197.4		34:36	*******	34.11	 34.25
6	Cl	 213.0	****	37.12			

C20N2H14,2HCl,2PtCl2...... 574.4 100.00

Acetate of Nicotine. — Nicotine supersaturated with glacial acetic acid and exposed to the air, forms after 8 days a neutral syrup. (Posselt & Reimann.) Acetate of nicotine crystallises with difficulty. (Henry & Boutron.) Strong acetic acid forms with the ethereal solution of nicotine a clear mixture, from which water extracts the acetate of nicotine. (Posselt & Reimann.) According to Schlössing also, acetate of nicotine is soluble in ether.

Oxalate of Nicotine. - Crystalline, easily soluble in water. (Posselt

& Reimann.) Insoluble in ether. (Schlössing.) Laminse having a pearly lustre. (Henry & Boutron.)

Nicotine forms a crystallisable salt with nicotic acid (x, 229).

Tartrate of Nicotine is obtained by evaporating its solution in the air, as a crystalline granular mass easily soluble in water. (Posselt & Reimann.)

Purpurate of Nicotine. — Aqueous alloxan, to which a few drops of nicotine are added, assumes in a few seconds a dark purple colour, and subsequently, there are formed in the red liquid, colourless rhombic tables, very similar to those of uric acid when the latter have acquired their obtuse angles; they may be freed from the mother-liquor by washing with a small quantity of water. The crystals dissolve in cold, moderately dilute potash-ley, with splendid purple blue-colour and the odour of nicotine. The purple mother-liquor may be evaporated over oil of vitrial to a blood-red viscid syrup, which dries up to an amorphous mass; it is decolorised by absolute alcohol, with precipitation of brick-red flakes which dissolve in alkalis with carmine colour, emitting at the same time an odour of nicotine. (Schwarzenbach.) — Hence Schwarzenbach supposes that the mother-liquor contains acid purpurate of nicotine, and that the crystals contain the neutral purpurate. (Wittstein's Vierteljahrsschr. 6, 424 and 8, 170.)

Picric acid added to hydrochlorate of nicotine throws down sulphuryellow flocks. (v. Planta.)

Tincture of galls, added to aqueous nicotine, throws down a white curdy precipitate (Henry & Boutron); it forms, with hydrochlorate of nicotine, a whitish cloud, which disappears on addition of a few drops of hydrochloric acid, but is reproduced by a larger quantity. (v. Planta)

Nicotine mixes in all proportions of alcohol. The mixture, when distilled, gives off first a comparatively pure alcohol, then spirit contain-

ing nicotine. (Posselt & Reimann.)

It mixes in all proportions with ether, and the solution when distilled gives off pure ether, with only a little nicotine towards the end. It gives up all its nicotine to acids. (Posselt & Reimann.) Ether entirely removes nicotine from its aqueous solution.

Nicotine dissolves in about 40 pts. of oil of turpentine, easily in oil of almonds; the latter solution has a very sharp taste, and gives up all its

nicotine when shaken up with acetic acid. (Reimann.)

Appendix to Nicotine.

a. Nicotianine or Tobacco-camphor.

HERMBSTADT. Schw. 31, 442; abstr. Berz. Jahresber, 1823, 113.

Posselt & Reimann. Mag. Pharm. 24, 138; Berz. Jahresber, 1831, 193.

Lunderer. Repert., 53, 205.

Barral. Compt. rend. 21, 1376.

Obtained by Hermbstädt, in 1823, from Nicotiana Tubacus. -According to Landerer, it is produced in the drying of the tobacco, instantal much as fresh tobacco-leaves do not yield it. Preparation. The herb, either fresh or dry, is distilled with a small quantity of water, whereby a milky distillate is obtained, on the surface of which nicotianine separates after a few days in laminar crystals.

The remaining portion of the distillate is mixed with subacetate of lead, the precipitate decomposed by a not quite sufficient quantity of dilute sulphuric acid, and the liquid filtered from the sulphate of lead is left to evaporate. (Hermbstädt.) — According to Posselt & Reimann, this lead-precipitate is nothing but carbonate of lead, and does not yield any more nicotianine. These chemists pour 12 lbs. of water on 6 lbs. of tobacco-leaves; distil off 6 lbs; add to the residue 6 lbs. of fresh water; distil again; and repeat this treatment five times. The distillate deposits 11 grains of nicotianine, while nicotine remains in solution. Landerer extracts from the aqueous distillate of tobacco-leaves only a few drachms of water, from which the nicotianine separates on standing.

Properties. White, crystalline, laminar. Melts when heated, and then gradually evaporates (Hermbstädt); in some weeks, when exposed to the air in open vessels. (Posselt & Reimann.) Smells like fine tobacco (Hermbstädt); like tobacco-smoke and lilac-blossoms, more strongly when heated, but without exciting sneezing. (Hermbstädt.) On the tongue, or in the throat, it tastes like tobacco-vapour (Hermbstädt); not at all sharp, but warm and bitterly aromatic. (Posselt & Reimann.) When swallowed, it produces nausea and giddiness (Hermbstädt); a dose of 2 grains produces no particular effect. (Posselt & Reimann.) Neutral.

46 C					
2 N	28	****	7.30	*******	
32 H	. 32	****	8.33	********	8.23
60	. 48		12:50		13.13

According to Buchner (Repert, 53, 209) it is, perhaps, a compound of nicotine with a volatile vegetable acid.

Decompositions. Nicotianine turns brown when exposed to the air. (Hermbstädt.) — It is insoluble in nitric acid when cold, but dissolves in it when hot, giving off nitrous gas. (Posselt & Reimann.) — It dissolves in potash-ley (Posselt & Reimann), and gives off nicotine when distilled therewith. (Barral.)

It is soluble in water. (Hermbstädt.)—It is not sensibly soluble in aqueous hydrochloric acid, and remains unaltered when evaporated by contact with it.—According to Hermbstädt, it precipitates lead and mercuric salts; but, according to Posselt & Reimann, these precipitations do not take place.—It forms a white precipitate with tincture of galls. (Hermbstädt.)

It dissolves in alcohol and in ether. — The alcoholic solution becomes milky on addition of water (Posselt & Reimann); according to Hermb-

städt, it does not.

b. Empyreumatic Oil of Tobacco.

Zeise. J. pr. Chem. 29, 388; Ann. Pharm. 47, 127; Pogg, 60, 278.

Compare p. 221.

Preparation. Dry tobacco is distilled, and the resulting tar is rectified. The oil thus obtained is several times shaken up with water; then dried over chloride of calcium, filtered, twice rectified, a certain quantity of tar remaining behind each time, but only a small quantity the second time, and the first half of the distillate is collected.

Slightly pale yellow, transparent. Sp. gr. 0.87. Boils at about

195°.

11 0	66	71.00		71.26
11 H	11	11.79	********	12.01
2 0	16 O and N	17:21		16.73

The oil contained about 3 per cent. of nitrogen which was not included in Zeise's calculation. As Melsens found nicotine in tobacco-smoke, which nicotine was not separated in Zeise's mode of preparation, the nitrogen of the nicotine appears to have been present in the oil, which would make the calculation altogether wrong. (Kr.)

The oil turns brown in contact with the air. — Burns with a strongly luminous, sooty flame. — Potassium acts on it slowly in the cold, and attacks it strongly when heated, converting it into a brown-red, viscid mass which yields by distillation a light yellow, somewhat viscid oil, having a strong aromatic odour, while a pitchy mass remains behind. — When the oil is boiled for five or six hours in a long-necked flask with lumps of potash-hydrate, and a little water, ammonia is evolved, and a yellow oil passes over, which boils at 220°, has a less unpleasant odour than the original oil, and does not act upon fused potassium. This oil contains 79 90 p. c. C, 10 01 H and 10 09 O. The alkaline residue dissolved in water, filtered from the separated charcoal, neutralised with sulphuric acid, and evaporated, gives up butyrate of potash to alcohol.

The oil is nearly insoluble in water. — It dissolves iodine quickly, and with brown colour. — It absorbs a small quantity of dry hydrochloric acil gas, becoming thereby more viscid and brown-red, and recovering its pale

yellow colour on addition of ammonia.

It mixes in all proportions with alcohol and ether.

By slow combustion of tobacco in the pipe. Melsens (F. Ann. Chim. Phys. 9, 471) obtained nicotine (p. 221) and tar. The latter, distilled with water, yielded a brown oil having a sharp and peculiar empyrenmatic odour, while a black, viscid mass was left soluble in alcohol. The oil is lighter than water; begins to boil at 140°, after drying over chloride of calcium, the temperature soon, however, rising to 200°, and ultimately to 300°; and passes over, light brown at first, but afterwards of darker colour.

Methyl-nicotine.

 $C^{12}NH^9 = C^{10}(C^2H^3)NH^4,H^2$.

Stahlschmidt. Ann. Pharm. 90, 222; J. pr. Chem. 63, 89; Pharm. Centr. 1854, 680.

Formenicotin. Known only as a hydrate and in salts.

Formation. p. 226.

Preparation. — Nicotine is mixed with iodide of methyl; the action, which soon begins, is allowed to come to an end; the dark-coloured hydriodate of methyl-nicotine, which solidifies in a crystalline mass on cooling (syrupy, if the quantity of iodide of methyl is insufficient, but becoming crystalline on the addition of a larger quantity), is washed with alcohol, crystallised from water, and the concentrated aqueous solution is decomposed with recently precipitated silver-oxide, whereby iodide of silver and an aqueous solution of methyl-nicotine are obtained. This solution, evaporated over oil of vitriol at 100°, leaves a dark, viscid, new crystalline residue, probably consisting of hydrate of methyl-nicotine.

Its aqueous solution has a bitter taste. It is inodorous, has a strong alkaline reaction, and dissolves the cuticle like caustic potash.

It remains unaltered, when the solution of its hydriodate is heated

with iodide of methyl.

Methyl-nicotine is a strong base. It saturates acids completely, and forms salts, of which the sulphate, hydrochlorate, nitrate, and hydrocyanate crystallise with difficulty; the hydrofluate, acetate, oxalate, and tartate not at all. Aqueous methyl-nicotine precipitates other oxides from copper and iron salts. It dissolves recently precipitated hydrate of alumina.

Hydriodate of Methyl-nicotine. Soluble in water, less soluble in alcohol, and nearly insoluble in ether.

-	C12NI	H9, H1	223.1	****	100.00		
	1		127-1	****	56.97	······	56.92
	10 H		10.0	1000	4.48	*******	4.60
	N	***************************************	14'0	7110	6.27		
	12 C		72.0		32.28		32.86
						St	ahlschmidt.

Chloromercurate of Methyl-nicotine. — Prepared on mixing mercuric chloride with aqueous hydrochlorate of methyl-nicotine, and may be crystallised in nodules from hot water. Contains 59.47 p. c. mercury, and is therefore C12NH9, HCl, 4HgCl. (Calculation, 58.39 p. c. Hg.)

Chloro-aurate of Methyl-nicotine — Light yellow precipitate, produced by mixing the solutions of terchloride of gold and hydrochlorate of methyl-nicotine. It is nearly insoluble in cold water and alcohol. Dried at 100°, it contains 45.23 p. c. of gold, C¹²NH⁹,HCl,AuCl³ = 45.28 p. c. Au.

Charge at the state of Medity - minimizer. — Hydrochlorate of methyl-nicotine is precipitated with tichlicide of platfixum, and the precipitate is crystallised from boiling water. Crystalline product, sparingly soluble in cold water, insoluble in alcohol.

			St	ablechmidt
12 C	72-0	23-92	****	23.85
S	14-0	4-64		
10 H	10-0 .	3.32	****	3.44
3 C	145.5 _	35-35		
P:	94.7	32-77		33-03

Hydrochlorate of methyl-nicotine mixed with chloride of palladium, leaves on evaporation, a syrup which may be obtained on crystallimition from alcohol.

Ethyl-nicotine.

 $C^{2}NH^{11} = C^{2}(C^{2}H^{2})NH^{2},H^{2}.$

v. Planta & Kektlé Ann. Pharm. 87, 2; J. pr. Chem. 60, 287; Pharm. Centr. 1853, 890; N. Ann. Chim. Phys. 40, 280.

Aethyl-nicotin, Vinenicotin. — First observed by Hofmann (Ann. Phorm. 79, 31.) - Known only in combination with water and acids.

Formation. (Comp. p. 226.)

Preparation. Nicotine is mixed with excess of iodide of ethyl in a sealed tube, and heated for an hour in the water-bath, or till the mass solidifies in yellow crystals on cooling; the product is dissolved in water; the red resin which separates it forms especially when the heat is too look continued is removed by filtration, and the solution is left to evaporate; it then yields radiating crystals of hydriodate of ethyl-nicotine. On digesting the aqueous solution of these crystals with recently precipitated oxide of silver, indide of silver is precipitated, and an aqueous solution of ethyl-nicotine is obtained, which is colourless (or slightly reddish yellow, if prepared with crude hydriodate of ethyl-nicotine), inodorous, has a very bitter taste, a strong alkaline reaction, and dissolves the cuticle like caustic potash.

Ethyl-nicotine is C¹¹NH¹¹ (which, by addition of 1HO, becomes C¹¹NH²O, corresponding to NH⁴O), if nicotine = C¹¹NH⁷; or has the double formula, C²¹N²H¹⁴. (v. Planta & Kekulé.) In the formation of ethyl-nicotine, the molecule of nicotine (C²¹N²H¹⁴) is split up in such a manner, that from 1 Atnicotine and 2 At. iodide of ethyl, 2 At. hydriodate of ethyl-nicotine are produced. (Gerhardt's Traité 4, 185.) — Ethylnicotine, with addition of 1 H bears to nicotine the

same relation that tetrethyl-ammonium bears to triethylamine.

1. Aqueous ethyl-nicotine becomes turbid when Decompositions. heated, deposits a dark red-brown oil, and gives off when distilled, a brown oil and a strongly alkaline liquid, which exhibits a deep red colour by transmitted light, and a green iridescence by reflected light; both these liquids colour the skin yellow, and have a pungent odour of stinking fish. Aqueous ethyl-nicotine undergoes a similar decomposition when left to stand in the air or in vacuo.—2. Hydriodate and hydrobromate of ethyl-nicotine are not altered by potash-ley in the cold; but when heated with it, they yield the same products that are formed by the simple action of heat on aqueous ethyl-nicotine.—3. Hydriodate of ethyl-nicotine melts when heated, turning slightly brown, and yields a distillate of nicotine and iodide of ethyl, which partly recombine in the receiver, forming hydriodate of ethyl-nicotine.—4. A concentrated aqueous solution of ethyl-nicotine, heated with iodide of ethyl, is converted into hydriodate of ethyl-nicotine, without forming a base containing a larger proportion of ethyl.

Combinations. Ethyl-nicotine unites with acids, forming crystallisable and very soluble salts. It is a strong base, which expels ammonia from its salts, and behaves with saline solutions like the fixed alkalis, throwing down the heavy metallic oxides and the alkaline earths.

Aqueous ethyl-nicotine absorbs carbonic acid from the air. — Sulphate of ethyl-nicotine is a viscid syrup containing a few crystalline particles.

Hydriodate of Ethyl-nicotine. — Obtained by the action of alcoholic nicotine on iodide of ethyl, or by recrystallising from boiling alcohol the product prepared as described at page 236, in nodular groups of beautiful colourless prisms, which may be separated with some loss from the reddish yellow mother-liquor by absolute alcohol. It decomposes partially when its aqueous solution is evaporated, forming a red iodated resin. When heated, it decomposes in the manner above described (3). It is very soluble in water, sparingly soluble in alcohol and ether.

From oil	of vitri	ol.		v. Pla	nta & Kekulé. mean.
C ¹⁴ NH ¹²					53.55
C4NH1,H1	237.1	344	100.00	-	

Hydrobromats of Ethyl-nicotine. — When bromide of ethyl is brought in contact with nicotine, even in the cold, an oil is produced, which increases on heating the mixture in the water-bath, and finally solidifies in a crystalline mass. It is even more deliquescent than the hydriodate. It dissolves with moderate facility in absolute alcohol.

Hydrochlorate of Ethyl-nicotine is obtained as a radiated crystalline mass by evaporating its solution in vacuo.

Nitrate of Ethyl-nicotine. — Viscid syrup, containing a few crystalline particles.

Chloromurcurate of Ethyl-nicotine. — Mercuric chloride throws down from hydrochlorate of ethyl-nicotine, white flocks, sometimes caked together like a resin, which melt when heated, dissolve in boiling water, and separate in crystalline nodules on cooling. They may be washed with cold water.

				v. P1	ants & Kekulé.
14 C	84		15.22	*******	15.39
N	14	••••	2.54		
12 H	12	,	2.17		2.25
4 Cl	142	••••	25.72	••••	25·71
3 Hg	300		54.35	•••••	54.14
C14NH11.HC1.3HgCl	552		100-00		

Chloroaurate of Ethyl-nicotine. — Terchloride of gold added to hydrochlorate of ethyl-nicotine, throws down a sulphur-yellow precipitate, which crystallies from its hot aqueous solution on cooling in splendid gold-yellow needles.

v. Planta & Kekulé.

CHNHII-HCLARCB	440	100.00	
Aq			 43.93
C14NH12C14	252	 56.13	

Chloroplatinate of Ethyl-nicotine. — Hydrochlorate of ethyl-nicotine mixed with bichloride of platinum, throws down yellow flocks, which soon become orange yellow and crystalline, and separate from boiling water in orange-red prisms, generally acuminated. It is nearly insoluble in boiling alcohol, insoluble in ether.

From o	il of vitriol, or at	100	٠,	v. Pla	nta & Kekulé.
14 C	84.0		26.65	******	26.61
N	14.0	••••	4.44		
12 H	12.0	••••	3.81	*******	3.24
3 Cl	106.5		33.79		
Pt	98.7	••••	31.31	•••••	31.29
C14NH11,HC1,P	Cl ² 315·2		100.00		

Chloride of Palladium is not precipitated by hydrochlorate of ethylnicatine, but on evaporating the mixed solutions, a brown gum is obtained which, when its alcoholic solution is left to evaporate, leaves large brown rhombic tables.

With oxalic and acetic acid, ethyl-nicotine forms uncrystallizable salts.

Tannic acid does not precipitate aqueous ethyl-nicotine; picric acid produces sulphur-yellow flocks.

Amyl-nicotine.

 $C^{20}NH^{17} = C^{10}(C^{10}H^{11})NH^4,H^2.$

STARLSCHMIDT. Ann. Pharm. 90, 226.

Mylinicotin. - Known only in aqueous solution and as a platinum-salt.

Formation (p. 226). — Nicotine is heated with iodide of amyl in a scaled tube to 100° for several days; the product is dissolved in water; the separated iodide of amyl is removed; and the solution is digested with

recently precipitated oxide of silver, whereby iodide of silver is separated,

and an aqueous solution of amyl-nicotine is obtained.

This compound behaves with saline solutions like ethyl-picotine; it saturates acids and forms salts, which cannot be obtained in the solid state, even by slow evaporation. The solution of amyl-nicotine, mixed with bichloride of platinum, throws down light yellow flocks, which, when dried at 100°, contain 28.25 p. c. platinum, and are therefore C¹⁰NH¹⁷,HCl,PtCl² (calc. 27.63 p. c. platinum).

Primary Nucleus C20H16.

Oil of Turpentine.

C20H16.

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Camphene (Deville); Essence de térébenthine; Essence of turpentine; Terpesthinol. Described in the 8th century by Marcus Gracus.

Sources. In the root, stem, branches, leaves, and pericarps of seven trees belonging to the coniferous family, and to the genera Pinus, Pics, Abics, Larix; hence also in turpentine, the resinous juice which examples from incisions made for the purpose in the stems of these trees.

Extraction. 1. By distilling various kinds of turpentine either alone or with water. — Steam or air, heated to 107°, is passed either directly through turpentine or through a spiral tube coiled up in the turpentine covered with water, and serving to convey to it the heat required for the distillation of the volatile oil. (Kates, Lond. J. Sept. 1854, 172; Aug. 1855, 86.)

When turpentine is distilled per se, the oil passes over first, and towards the end of the distillation, succinic acid sublimes. (Lecanu &

Serbat, J. Pharm. 8, 451.)

When Venice turpentine is distilled with water, the succinic acid remains dissolved in the water which passes over with the oil. Venice turpentine, distilled alone, yields first a more volatile, and afterwards a less volatile oil. (Unverdorben.)

Pine-resin, subjected to dry distillation, yields, together with the oil, a brown or yellowish, seldom colourless, turpentine-water, amounting to l-15 per cent. of the resin, and containing acetic acid. (Grimm, Ann.

Pharm. 107, 255.)

75:

13

2. By distilling various parts of coniferous plants with water. — In this manner, oil of turpentine may be obtained: From the cones of the silver fir (Abies pectinata, Dec.) (Zeller, Flückiger), which contain the volatile oil in the pericarps, and a fixed oil in the seeds (Zeller); from the branches of the spruce fir (Pinus abies, L.) Gottschalk, Ann. Pharm. 47, 237); from the cones of the dwarf-pine (Pinus Mughus, Scop.) (Blanchet & Sell); from the cones of the Scotch fir (Pinus sylvestris, L.), which serve for the preparation of forest-wool. (Hagen.)

Purification. 1. By distilling crude oil of turpentine: (a.) by itself; (b.) with water. The oil which floats on the surface of the water in the distillate is skimmed off, and dehydrated by agitation with chloride of calcium. — When oil of turpentine is rectified with water, the oil at first passes over alone, and is not accompanied by water till towards the end of the distillation, probably because the formation of vapour of water requires 550° of heat, whereas, according to Despretz, that of oil of turpentine vapour requires only 76° (? Gm.) Aubergier.—
(c) With aqueous alkalis or alkaline earths. Oil of turpentine is distilled with milk of potash and lime (100 pts. of the oil with 100 pts. water, 1 pt. carbonate of potash, and 1 pt. quicklime. Berl. Industriebl. 1841), the resin dissolved in the oil then remaining with the lime. (Guthrie, Sill. Am. J. 21, 291.)

2. By agitation with oil of vitriol. — The oil of turpentine is shaken up with oil of vitriol diluted with an equal bulk of water, and then left at rest, whereupon the liquid separates into two layers, the lower of which takes up the brown resin; the supernatant oil may be further purified from resin by renewed agitation with the acid, till the latter no longer becomes coloured, and at last completely freed from it by water.

(Guthrie.)

3. By treating crude oil of turpentine with a quantity of alcohol less than sufficient to dissolve it. — When 8 pts. of oil of turpentine are shaken up with 1 pt. of the strongest spirit (with slightly rectified spirit, according to Schultze, N. Br. Arch. 74, 114), and the mixture is left at rest, two layers of liquids are formed, the upper of which is a solution of the resin originally contained in the oil, while the lower consists of the purer oil, which may be completely purified by repeated agitation with fresh quantities of alcohol. (Nimmo, Schw. 36, 245; J. of Science, 13, 441.)

VOL. XIV.

Modifications of Oil of Turrentine. — The volatile oil obtained from conferm Dumas, even when prepared by distillation from one and the same species. Berthelot is by no means a simple oil, but a mixture of isomeric oils, which, though identical in chemical composition, differ in boiling point, specific gravity, and optical properties, according to their origin and mode of preparation, and according to Bouchardat, are probably formed from the oil originally contained in the turpentine by the action of the air at the moment of its separation, or, according to Berthelot, partly exist in the turpentine ready formed. Accordingly we have to distinguish—

- 1. French oil of turpentine, obtained from Bordeaux turpentine, the produce of Pious Arritema. - When French oil of turpentine is mixed with carbonate of potash and carbonate of lime, the mixture left at res for a day, and then distilled in vacuo, first on the water-bath, and then on the oil-bath, the receiver being coaled with ice, the oil distils between 80' and 150', while the residual turpentine becomes thicker. The oil which distils between 80 and 180 appear to consist of only one substance; but the latter portion of the distillate is a mixture of isomeric hydrocarbons and oxygenated oils, whose specific gravity, boiling point, and rotatory power vary between such narrow limits, that the isolation of a single definite product from them is impossible. Even the oil obtained by repeated fractional distillation, yields, when again distilled, a distillate of different properties, though identical in chemical composition. - The portion of the oil, which, when it is shaken up with a quantity of alcohol insufficient to dissolve it, either remain below the alcoholic solution, or are separated therefrom by water, likewise exhibit different properties, the alcohol dissolving especially those oils which have comparatively little rotatory power. (Berthelot.)
- 2. English oil of turpentine (Camphene spirit) from the Carolisa turpentine of Pinus tuda. L. (Guibourt & Bouchardat), or that of Pinus Australis, Mich. Berthelot.) Turpentine from Pinus Australis, fractionally distilled four times in vacuo, yielded distillates of like composition but different rotatory power. Berthelot.)
- 3. German oil of turpentine, from the turpentine of Pinus sylvestris, L. P. nigra, Link, P. rotundata, Link, P. abies, L.
- 4. Templin oil, from the cones of Pinus Mughus (Blanchet & Sell): from the cones of Abies pectionta, Dec, especially that obtained in the Emmenthal, Canton Bern, and in Aurgan. (Fluckiger.)
- 5. Venetian oil of turpentine, from the turpentine of Larix Europea, Dec.

Properties. Colourless, mobile, transparent oil. Commercial oil of turpentine is yellowish, templin oil slightly coloured (Blanchet & Sell), the oil from the needles of the Scotch fir, yellowish-green (Hagen); templin oil becomes yellowish green after some time. (Flückiger.)—Sp. gr. 0.86 at 22° (Saussure', 0.872 at 10° (Despretz), 0.86 at 31' (Brisson), 0.879 (Aubergier), 0.867 at 14' (Brix, Pogg. 55, 380), 0.872 (Biot), 0.86 (Soubeiran & Capitaine), 0.8902 at 0° (Frankenheim, Pogg. 72, 422).

French oil of turpentine has a density of 0.865 at 13" (Caillet, Fhorm. 16, 440); 0.8806; — after rectification with water, 0.8736 to

0.8890; — after distillation without water, 0.8730; — oil ten years old distilled over potash, 0.87; — Strasburg oil of turpentine distilled with water, 0.863 (Guibourt & Bouchardat); — 0.8654 at 15°; — after distillation in vacuo between 80° and 100°, it is 0.864 at 15°; — when purified by shaking up with alcohol, 0.8616 to 0.8630, while the oil which distils between 280° and 290° has a density of 0.9203 at 16°. (Berthelot.) — English oil of turpentine: 0.863 (Guibourt & Bouchardat); 0.8665 at 15°; after fractional distillation, 0.886 to 0.878. (Berthelot.) — Oil of turpentine from the silver fir, 0.850 to 0.856 at 13° (Caillot), 0.85 (Zeller); templin-oil (Flückiger), 0.856 at 6° and 0.842 at 30°. (Berthelot.) — Oil from the Scotch fir, 0.865 at 13° (Caulliot); crude oil 0.8859 at 12°, rectified, 0.868 at 12°. (Hagen.) Oil from the spruce fir, 0.880 at 15° (Blanchet & Sell), oil from the branches treated with potassium (vid inf.), 0.856 at 20°. (Wöhler.) Oil from Abies Canadensis

and Venetian oil of turpentine, 0.863 at 13°.

Boiling point, 156.8° (Despretz); recently rectified, 152°, old, 158° (Ure), 150° (Blanchet & Sell), 157° (Aubergier), 159.2° (Brix, Pogg. 55, 380), 156° (Frankenheim, Pogg. 72, 422). — Oil from the spruce fir boils at 155° (Blanchet & Sell), that from the branches, after treatment with potassium, at 167° (Wöhler); templin-oil from Pinus Mughus at 165°, templin-oil (Flückiger) at 172°. (Berthelot.) — The first products of the distillation of French oil of turpentine, purified with alcohol, boil at 159.5° to 160° under a pressure of 750° (Berthelot.) — It does not solidify at — 20° (Cailliot), not even at — 110° (Faraday, Pogg Ergänzungsband, 2, 216). At — 27° it deposits camphor, which melts at — 7° (Margueron, J. Phys. 45, 136). — Expansion at sp. gr. 0.879 from 0° to 100° = 0.106927; of oil boiled for 10 minutes and distilled = 0.103087 (Aubergier); at 0° and sp. gr. 0.8902, = 1 + 0.000874t + 0.000001248t² between 11 and 145°, or from 0 to 100° = 0.09722 (Frankenheim, Pogg. 72, 425); of templin-oil (Flückiger) from 30° to 130° = 0.112. (Berthelot.) — Compressibility for one atmosphere at 12.6° = 0.000657. (Aimé, Pogg. Ergänz. Bd. 2, 237.) — Refracting power = 1.471 (Becquerel & A. Cahours, Compt. rend. 6.867; also Pogg. 51,427); 1472. of the thickened oil = 1.4938, after being liquefied at 40° = 14938 (Deville, Compt. rend. 11.865; also Pogg. 51, 433); of templin-oil (Flückiger) = 1.467 (Berthelot).

The optical rotatory power of oil of turpentine is independent of that of the turpentine from which it has been prepared. French oil of turpentine rotates to the left like turpentine itself, but with different strength; English oil of turpentine to the right, whereas the turpentine (from Pinus tæda) used in its preparation rotates to the left; Venetian oil of turpentine rotates, according to Soubeiran, to the left, but Venice turpentine rotates to the right. (Guibourt & Bouchardat, Biot.) The Prench turpentine oil of commerce consists chiefly of lævo-rotatory oils, and contains but a small proportion of the dextro-rotatory. (Berthelot.)

and contains but a small proportion of the dextro-rotatory. (Berthelot.)

Levo-rotatory power of: French oil of turpentine, 39·95° (Biot),
43·38°, calculated for a sp. gr. of 1 (Soubeiran & Capitaine), 28·82°
(Guibourt & Bouchardat), 35·4° (Berthelot). After rectification with
water: first distillate, 31·657°, second distillate 22·327°; distilled without
water, 33·23°; oil ten years old rectified over carbonate of potash, 33·95;
Strasburg turpentine-oil distilled with water, 11·69° (Guibourt & Bouchardat); distilled between 80° and 100° in vacuo, 32·4°; fractionally
distilled, between 33·7° and 32·25°; purified with water, 35·6° to 33·7;

that which distils from 240° to 280°, 6.5°. (Berthelot.) By distillation over the open fire, oil of turpentine gains in rotatory power from 28:33 to 33:23° (Bouchardat). — Of Swiss oil of turpentine, 11:2; of templin oil (Flückiger), 76:9° (Berthelot); of Venetian oil of turpentine, 5:24. (Guibourt & Bouchardat.)

Dextro-rotatory power of : English oil of turpentine from Pinus toda, 18.6° (Guibourt & Bouchardat); from Pinus Australis, 18.6°. (Berthelot.) After fractional distillation: 1 = 18.9°; 2 = 18.8°; 3 =

16.4; 4 = 17.2. (Berthelot.)

Specific heat = 0.462 (Despretz), 0.488 (De la Rive & Marcet) 0.42593 (Regnault), 0.41 (Brix, Pogg. 55, 380), 0.416 at 2°. (Person, Pogg, 74, 422.) Heat of combustion evolved in the combination of 1 gramme of oil of turpentine with oxygen = 10496; of 1 litre of turpentine-oil vapour = 68349 heat-units. (Grassi, N. J. Pharm. 81,

177.)
Vapour-density = 5.01 (Despretz), 5.013 (Gay-Lussac), 4.763, (Dumas.) Latent heat of vapour = 76.8 (Despretz), 59.23 or 62.23 (Brix, Pogg. 55, 381); 68.7 (Frankenheim, Pogg. 72, 422). Specife

heat of vapour 177-87.

t of vapour 177.87. (Ure.)
The vapour, mixed with a large quantity of atmospheric air, produces a peculiar intoxicating effect when inhaled (Letellier, Compt. rent. 39, 243); in rooms recently painted with turpentine colours, it produces poisonous effects. (Favrat, Compt. rend. 45, 886.) It prevents the germination of seeds. (Ville, Compt. rend. 41, 757.) The small of turpentine oil may be removed from vessels by shaking them up with a mixture of mustard and cold water. (Jourdan, J. Chim. med. 22, 727.)
Oil of turpentine is neutral to vegetable colours. The oil from the

needles of the Scotch fir reddens litmus, because it contains formic acid. (Hagen.)
Its taste and odour are strong and peculiar, like that of turpentine.

Strasburg oil of turpentine (Guibourt & Bouchardat), that from the spruce fir (Blanchet & Sell), has an agreeable odour like that of lemons. The oil from the branches of the spruce fir smells like fir-branches and fixed oil of laurel, but after treatment with potassium, it has an odour of lemons and sweet oranges (Wöhler); templin oil has a balsamic odour (Flückiger); templin oil from Pinus Mughus smells like orangeflowers (Blanchet & Sell); oil from the silver fir smells aromatic (Cailliat); like cumin, and has an aromatic, warming, slightly bursing taste (Zeller); oil from the Scotch fir, has an aromatic odour like that of lavender. (Hagen.) The smell and taste of oil of turpentine depend upon the amount of ozone which it contains; strongly ozonised oil has a strong odour and taste of peppermint, and a few drops placed upon the tongue produce a peculiar persistent pain; the newly rectified oil does not produce this effect, and has a fainter odour. (Schönbein.)

20 C 16 H			Lab	87.6	re. 2.			84-59		88-88
C20H18	136	100-00	*******	99 9	*******	99.434		96-32		190-00
5. Blanch & Sell.		Dumas.	7.	Wöhler	r.	8. Hager	16	9. 1	Serthel	st.
88-56		88-4		88-38	********	88-21		88-0		87-1
11.52		11-6				11.61		12.3		
100 08	3mi-	100-0		100-16		99.82	*******	100-3	-	99-9

		Vol.	Density.	
	C-vapour		 8·3200 1·1088	-
ı	Vapour of turpentine-oil	2	 9·4288 4·7144	

2, according to Saussure, still contained 0.566 nitrogen; 4, according to Oppermann, contained 3.6728 oxygen; 5, oil from the spruce fir; 7, from the branches of the spruce fir, after treatment with potassium; 8, from the needles of the Scotch fir;

9, a. French; b. English oil of turpentine.
Oil of turpentine is a hydrocarbon, since its vapour passed, together with sulphur-Oil of turpentine is a hydrocarbon, since its vapour passed, together with sulphurvapour, through a red-hot tube, yields nothing but bisulphide of carbon and sulphurretted hydrogen. It contains 10 vols. carbon to 8 vols. hydrogen, and the condensation of 4 vols. hydrocarbon (hydrogène percarburé) with 2 vols. carbon-vapour,
produces 1 vol. vapour of oil of turpentine. (Houton-Labillardière.) — Saussure
found nitrogen in oil of turpentine, as well as carbon and hydrogen. Hermann found
no nitrogen, but carbon and hydrogen in the ratio of 4:3. Oppermann found 4 per
cent. of oxygen, together with carbon and hydrogen, and assigned to oil of turpentine
the formula, C²⁰H³¹O. Dumas concluded, from Oppermann's analysis, that oil of
turpentine was a compound analogous to ether, and containing the radical camphogen turpentine was a compound analogous to ether, and containing the radical camphogen (supposed by him to exist in camphor), in combination with 1 At, water; but from his own analysis he inferred that it is a compound corresponding to the formula CloHs, and that the oxygen found by Oppermann proceeded from impurities. The suggestion advanced by Thénard, that oil of turpentine is a mixture of several hydrocarbons, was thought by Blanchet & Sell to be corroborated by its behaviour with hydrochloric acid, these chemists supposing that oil of turpentine is a mixture of two isomeric oils of the formula C'BH, one of which, dadyl, forms a solid, the other, peucyl, a liquid compound with hydrochloric acid, and that the variations in the properties of oil of turpentine with hydrochloric acid, and that the variations in the properties of oil of turpentine depend upon the relative quantities of these two compounds. Since, however, oil of turpentine has a constant boiling point, and its rotatory power remains unaltered in the solid hydrochlorate, whereas in the liquid compound it is very weak, Soubeiran & Capitaine suppose that it is a simple compound, but is resolved into two isomeric compounds under the influence of hydrochloric acid. The dadyl of Blanchet & Sell is identical with the camphene of Soubeiran & Capitaine and with the turpentine oil of Deville. The peucyl of Blanchet & Sell is identical with the peucylene of Soubeiran & Capitaine, and the terebene of Deville. According to Soubeiran & Capitaine, both these compounds are products of the decomposition of oil of turpentine; but according to Deville, this is the case with terebene only. to Deville, this is the case with terebene only.

Decompositions. Oil of turpentine exposed to the air gradually Competence of the exposed to the air graduary becomes yellowish and viscid, resinises completely after a short time (Unverdorben, Blanchet & Sell, Zeller, Wöhler), and ultimately forms accid (Boissenot & Persot; Bizio, Brugn. Giorn, 19, 360), formic acid (Laurent, Rev. scient. 1842, 119, Weppen), resin (Unverdorben, Weppen), and, in presence of water, it forms hydrate of turnertine-oil or turnertine grapher. (Reissenot & Porsot) (Gillof turnertine which has turpentine-camphor. (Boissenot & Persot.) Oil of turpentine which has become thick by exposure to the air, contains a large quantity of resin partly soluble in potash, partly insoluble (this portion, however, being soluble in alcohol), and a compound of pyrocolophonic acid with a volatile oil, which latter is not soluble in potash, except in presence of the pyro-acid just mentioned, and can be distilled only with excess of potash and water. (Unverdorben). In oil of turpentine which had been long exposed to the air, hard crystals were found to have formed; on distilling it, aqueous acetic acid finally passed over, and from this distillate, after standing for some time at 7°, crystals again separated. (Boissenot & Persot.) On the covers of zinc boxes in which oil of turpentine had been kept, Laurent found white, granular crystals of formiate of zinc. The presence of formic acid in oil of turpentine may be recognized by the acid reaction of the oil and of the water which be recognized by the acid reaction of the oil and of the water which

passes that in listilling it. It is produced by absorption of oxygen

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this of targentine, when expected to the air. Fikewise forms an add resin. when may be entructed by arithmen with water and carbonated magnesia. From the expectes so than of the magnesia-compound, add throw hown a wante presinction, whose also belie solution precipitates most metal in salts, even in the cold, but corrusive sublimate only when heated. From the presipitate obtained with acctate of lead, and deconposed by salpairemed ayaregen, also hel extracts an acid resin, which remains when the solution is evaporated, partly as a brown viscid man, partir in white dry-tailine states. The lead-compound contains 45:39 p at marten, ir47 ayarrigen leves oxygen, and 29-60 PbO; whence it ia CPHPOLPho.

2. Employ notice passing between the terminal wires of a battery immer-ed in all of turnentine and placed very close together but not quite in contact exerte luminosity on the oil in contact with the cole of the wires, and give rise to the evolution of a permanent gas. (Poggenderal Pogg 71, 227.

S. Oil of turnentine is entirerted by heat into a less volatile oil When heated in close vessels under a pressure of several atmosphere, it is partly oraverted into isomeric compounds of high boiling point (et. Interviews and Mertineses. Berthelot. Heating over the open five increases its tower of desciving on atchouc and likewise its rotatory power. When it is listilled with brick-dust over the open fire, it turns yellowish, sequires the odour of thyme and rock-oil, boils at 134, decreases in density from 0.5756 to 0.542, and likewise in rotatory power, which in time exteriments was found to diminish from 28 83' to the left to \$ 55', 13 52' and 1903' to the left; but, its power of diselving tal attribute is augmented. Buchaniata). In general, the mittory to wer if it of turn-name is iminished by heating above its bolling point an ier pressure: that if the dextro-rotatory English oil is first dimin shed, and afterwards changed in direction, becoming lavo-rotatory. Its specific gravity is increased and its chemical properties are altered to a certain extent according to the degree and duration of the heating. Berthelet.

From ell of targentine which had been heated to 150° for three days. crystals sublimed, which likewise collected in the neck of the retort when the cil was distilled in the water-lath, and emitted a resinous odow when thrown on red-hot coals. (Cluzel, Chomet & Boullay, Ann. Chin. 51, 270.1 - Oil of turpent ne sealed up in thermometer-tubes, becomes suddenly collured and contracts when heated above 200°. (Aubergiet) - The pitatory rewer of oil of turpentine is not altered by heating it in an atmost here of carls nie acid, even for 60 hours; but French oil of turpertine, having a density of 0:8654 at 15° and a rotatory power of 35.4 to the left, after being heated in sealed tubes to 360° for five hours, exhibits a density of 0.9154 at 11°. Oil of turpention dissolved in alcohol exhibited after heating for an hour and a-half to 360% a rotatory power of 12 to the left. - English oil of turpentine of sp. gr. 0.8665 at 15°, and 186 dextro-rotatory power, exhibits after four hours heating to 250°, a density of 0.8657 at 15°, and dextro-rotatory power 15°3°; after sixty hears heating to 2.0° - 260°, a levo-rotatory power

35; after two hours heating to 200°, la-vo-rotatory power = 99°

(isoterebenthene); and after five hours heating to 360°, a density of 0 9075 at 11°, and a lævo-rotatory power = 5.6, gas being also given off from it. Swiss oil of turpentine of sp. gr. 0.8618 at 15° and lævo-rotatory = 11.2°, exhibits after 74 hours heating to 300°, a sp. gr. = 0.8906

at 14°, a lavo-rotatory power = 1.55°, and gives off gas.

The products obtained by overheating oil of turpentine, exhibit in particular an increased power of absorbing oxygen. They are mixtures of several hydrocarbons isomeric and polymeric with oil of turpentine, some of them having boiling points near that of the original oil, while some boil at higher temperatures. (Berthelot.) In the same interval of time, 100 vols. French oil of turpentine absorbed 3.4 vol. oxygen, English 4.7, Swiss 4.9 vol.; after being heated to 300° for 42 hours, the French oil absorbed 5 vols, the English 9.7, and the Swiss 1.64 vol. oxygen. (Berthelot.)

4. By a red-heat. When oil of turpentine mixed with air is passed through a red-hot iron tube filled with coiled copper-foil, the products collected in the receiver are a large quantity of water, needle-shaped crystals, and yellow tar, which gradually unites with the crystals, an odour of oil of amber being at the same time evolved. (Richter, Ann.

Pharm, 32, 125.)

5. Oil of turpentine is inflammable, and burns with a bright smoky When crystals of anhydrous chromic acid are placed on an asbestos-wick moistened with oil of turpentine, and projecting 1 of an inch from a spirit-lamp filled with oil of turpentine, the oil takes fire and reduces the chromic acid to chromic oxide, which continues to glow if the flame be carefully blown out, and forms a peculiar-smelling transparent liquid, not containing naphthalin. (R. Böttger, Ann. Pharm. 57, 134.)

Rectified oil of turpentine is used for illumination, either alone or

mixed with other illuminating materials. A mixture of 4 vols, spirit of wine of 95 per cent., and 1 vol. oil of turpentine burns very clearly in lamps of peculiar construction; the illuminating power of the mixture is not increased by distillation. (Auduard, J. Chim. méd. 19, 717.) — A mixture prepared by heating together 5 pts. of alcohol, 10 pts. oil of turpentine, and 1 pt. oleic acid, burns with a white light, without smoke or odour of tarpentine. (Rousseau, J. Chim méd. 22, 300.) — 4 pts. of rectified wood-spirit and 1 pt. of oil of tarpentine rectified over lime burn in lamps of peculiar construction, without smoke and with a bright white flame. (Fabre, Compt. rend. 21, 161.)

6. Oxygen gas is abundantly absorbed by oil of turpentine. in the course of fourteen days' exposure to the air, absorbs its own volume of oxygen, and does not subsequently give it off on boiling. (Brandes.) 1 vol. oil of turpentine takes up in four months, 20 vols. oxygen, and if previously saturated with carbonic acid, gives off 16 vols. of that gas; in eight months, it absorbs 24.3 vols. oxygen; in nine months more, 27.2 vols.; in the tenth month, at a temperature of 18° to 20°, somewhat more than 1 vol. daily; but in the following thirty-three months only 9 vols. more; making the quantity of oxygen absorbed in the whole 43 months, 128 volumes. It acquires at the same time a dark yellow-brown colour, deposits a few volatile crystals, but remains liquid, and, after it has absorbed 50 vols. oxygen, gives off carbonic acid and hydrogen; but after evaporation, or after exposure to the sun, it deposits a very acid watery liquid, so that the evolution of hydrogen is perhaps a consequence of the decomposition of this water

professibly the existing of the oil of turpentine. (Saussure, comp.

and eviluate if hydrochoric schlarine gas, with rise of temperature and eviluation of hydrochoric acid. If the chlorine be passed into it, the chlorine has process, the oil of SIVIT IN 1787. MINI IN excess only at the end of the process, the oil of the p carrier, has a litter-sweet taste, tirns the plane of the polarization to the right, and is a mixture of chloridated oil of turpentine and chloroterthe first and is a mixture of the managed of of temperature and consistence. They lie. Oil furnishing is turned deep yellow by chloring gap becoming at the same time, thicker, but not opaque, and not forming any articlal camplior. Clared When 6 pts. of oil of turpentine are beauted to believe with 25 pts. peroxide of manganese and 100 pts. Awarded the acid with frequent agreation at the beginning, acid water agreement agreement which is beauter than resses ever a getter with a visely vellow liquid, which is heavier than water has in armatic of undes not contain free chlorine, boils between the armatic property of a large quantity of hydrochloric acid, and wanted a resolute, which is yellow, green, blue, ultimately black and think, and schilles in cooling. This distillate is perhaps dentical with the product formed by the direct action of chlorine upon oil of turns-

the product formed by the direct action of chlorine upon oil of turpeture. That will

So From the freeding sees oil of turpentine, eliminating hydrochloric actional forming brominated oil of turpentine. (Deville.) On mixing also introduce with few more of bounne, hydrobromic acid is evolved, the oil become beautiful as converted intra yellow uself resin. (Balard, Ann. Chim. Phys. 31, 1777. Presh oil frameworker mixel with 1 of its bulk of Water, becomes branch when brom me is arrainably added to it, destroys the colour of the brom me is that tight has been added in the proportion of 228 pta of brom me is that tight has been added in the proportion of 228 pta of brom me is that tight is seen added in the proportion of 228 pta of brom me is that tight of mix if turpentine, and is converted into a colourises around a first of Williams.)—When oil of turpentine is mixed with appears by irrelating and dilute sulphuric acid, a large quart by of water and appears bromate of potash added to the mixture as any as the source as the readers a slight orange colour after agitation, and as the fastress of the steers a slight trange colour after agitation, and the excess of he were then removed by means of aqueous hyposulphite of solution of interpretable is found to have taken up a quantity of becomes varying with the age and origin of the oil, viz, French oil of the power of fill 2 p. c. An arman 2002 p.c.: German 2271 p.c. one however in our or experiments are ably with impure or peculiar oil

28 Tive New York and it ill of turpentine, with dark green colour at the two is the solution of the colour at the two is the solution of the value of the solution of the solu of the point we act in the artifer with great violence, forming a large quity of the violence artifer with great violence, forming a large quity of the violence of the only after condensation and which that or explosion. Vapour of oil of the portions substituted by the discussion of the proof of the artistics of oil of the pentine are placed together units a bolly or the rid ne is converted in the course of three days into a cark will resimile a region and hydronical resimilation. In the discussion of the about 16 filed

done and which " are upon the resim, and after a week, if the glass be filled with the trapective so had become before the business believe them it. The respective so had been freithed trethe up when shaken with aqueous carbonate of petash, sinks to the letters, and after washing with alread,

yields by dry distillation, vapours of iodine and a thick oil like oil of mace, while charcoal and a small quantity of iodide of potassium remain behind. Its solution in ether gives with corrosive sublimate, red iodide of mercury, and with subacetate of lead, it yields after a few hours, iodide of lead. - After digestion with caustic potash, washing with alcohol, solution in 4 parts of ether, and evaporation of the solution at a moderate heat, it remains as a black, dry mass which has a balsamic and iodine-like odour,—burns when set on fire, with sparkling and a very smoky flame, - gives off, when heated, iodine and hydriodous acid in yellow needles,—is insoluble in water, and dissolves slowly with dark yellow colour in alcohol of 80 per cent., readily in ether. The dark brown ethereal solution is decolorised by agitation with potash-ley, and the decanted ether yields by evaporation a yellowish red, inodorous and tasteless resin not containing iodine, while the potash-ley takes up a quantity of iodine equal to 42.56 per cent. of the weight of the resin. (Winckler.)

When iodine is distilled with oil of turpentine, hydriodic acid is produced, together with a blackish viscid oil which is decolorised by agitation with aqueous potash (Deville); charcoal remains behind, and the distillate containing hydriodic acid deposits white flocks when shaken up with potash. (Guizot.) The brown solution of iodine in an equal quantity of oil of turpentine, the formation of which is attended with evolution of heat, gives off, when distilled to dryness, a large quantity of hydriodic acid, then a brown oil, and lastly a balsam which sinks to the bottom, while charcoal remains behind. The distillate when exposed to the air, gives off yellowish vapours, having a pungent odour like that of hydriodic acid, tastes very sour, gives off part of its hydriodic acid on exposure to the air, and the whole when placed near ammonia (the ammonia at the same time entering into the oil, Gm.), and then appears colourless, has a disagreeable taste and empyreumatic odour, and deposits the brown balsam which passed over with it, together with a small quantity of dissolved iodine. Oil of turpentine distilled with rather less than an equal

quantity of iodine passes over nearly unaltered. (Guizot.)
10. Nitric acid acts on oil of turpentine in various ways, according to its strength and quantity and the duration of the action. Strong uitric acid acts on oil of turpentine with great violence, and often sets it on fire (Blanchet & Sell); an excess of the acid, diluted with an equal weight of water, forms, after continued boiling, carbonic acid, hydrocyanic acid, terephthalic acid (xiii, 13), terebenzic acid, acid resins, terebilic acid (xii, 467), oxalic acid, terechrysic acid (xi, 424) (Cailliot), together with acetic, propionic and butyric acids. (Schneider.) By the action of moderately dilute nitric acid, acetic acid is produced; by long continued boiling with very dilute nitric acid, nitrogen, carbonic acid, and carbonic oxide are evolved, whilst a resin remains, insoluble in water, and smelling of formic acid. (Deville.) — Nitric acid, mixed with pt. alcohol, partially converts oil of turpentine into turpentine-camphor. (Wiggers, Ann. Pharm. 57, 247.)

Oil of turpentine, from turpentine produced in northern countries, is scarcely heated by nitric acid. (Bonastre, J. Pharm. 11, 529). When a small quantity of oil of turpentine is heated with excess of nitric acid diluted with an equal weight of water, as long as red vapours continue to escape, carbonic and hydrocyanic acids are evolved, and a quarter of the oil passes over with somewhat diminished rotatory power, while resins and an acid liquid remain behind. The resins consist of terephthalic acid, insoluble in alcohol, and three resins soluble therein according to Chantaci. N. J. Pharm. 24, 166, they consist of two substances mutually hypothesis acid, one of which dissolves in ammonia with red middle and is precipitated therefrom in yellow flocks by acid, while the other is his little in ammonia and in the fixed alkalis; both however, well taked he when boiled with potash). The acid liquid mixed with water, after evacoration, deposits a yellow pitchy man, consisting if result respirable acid and terebenzic acid (according to Smallery a Famou. If we there is the first acid and different from terephthalic acid, while the mother liquid remains exalic acid (quadroxalate of potash, according to Karonesian, together with terebilic acid and a small quantity of terephthalic acid.

The liquid continues that it is only chlorinated nitric acid that produces that acid with all of turpentine, and, on the other hand, he terebilic acid that is produced by pure nitric acid. (E. Kopp, Compt. Class. 1844, 185)

When 3 in 2 not if strong nitric acid diluted with an equal weight of water, are very gradually impt into oil of turpentine very gently heated in a large talunated retort, the portion which distils over being well cooled a violent action seen takes place, the first portions of additioning the oil brown, while the latter portions produce heating, challing and emission of red firmes. If the mixture be boiled for 24 hours after the action is even the resin adhering to the sides of the retort disappears, a vise I seam forms for a while on the surface, and the nitric acid, on cooling, letosits a brown, bitter, acid resin. If the clear liquid in the retort be list lied fown to one third, and afterwards distilled of several times, with addition of water, a greenish yellow liquid, rendered turb diby drops of oil passes over first, then a clear distillate, containing obsides after acid, accuse, propionic, and butyric acids. (Schneider.)

the sides with social section propionic, and butyric acids. (Schneider.)

11. When the interpretation saturated with nitrous acid, is distilled, a block result a character together with a red volatile oil, smelling like

oth of tureerure and hitter almoni oil. (Deville.)

12 to rearrable composes oil of turpentine with rise of temperature, exclusion if such are seed, and formation of terebene and colopiere. Devile. The mixture becomes heated, gives off suphurous acid, and becomes for which wiscid. (Hatchett.) On gently beating the mixture, a viscil mass is formed, partly soluble in water, parely sink no there is statingly soluble also in alcohol (Link); an old smelling tike strawberries, a slightly volatile acid, a large quantity of light brown res n. mobile at 1600, insoluble in potach, also extractive matters. Universitation Oil of turpentine distilled with 4 pt of strong supporte acid, yells a red brown oil, which when free from sulphuric acid by petash, has an aromatic odonr like that of anim oil (Perse , like recked), oil of turrent ne. and oil of rosemary. (Held-When cil of turpentine is poured upon strong mane, E.g. 14, 488. sulphuric acid, so that the two may not mix, the oil of turpenting the top becomes thick after 6 or 8 days, dissolves readily in strong sulphuric acid, and may be separated therefrom by water. Old turpentine, poured in like manner upon sulphovinic acid, dissolve sparingly, gives off sult bureus acid when distilled, and yields a mobile oil containing sulphuric acid, whilst a thick oil, likewise containing that need remains behind. By rectiving the distillate over antimonide of poinssium, it becomes in bile, free from sulphuric acid, acquires an oder nearly the same as that of oil of turpentine, and resinises easily when exposed to the air. The viscid oil remaining in the residue may be structed by other, has an odour of camphor, and does not resiste a

the air. (Richter, Ann. Pharm. 32, 125.) When equal parts of oil of turpentine and strong sulphuric acid are distilled together, two volatile oils (terebene and colophene) pass over, while a tarry and a solid residue are left behind. The distillate yields sulphuric acid to water; the tarry residue is black, tasteless, difficult to burn, appears to volatilise undecomposed when heated; dissolves readily and in all proportions in ether and in oil of turpentine, partially only in nitric acid, the insoluble portion becoming hard, not at all soluble in weak acetic acid or in alcohol of 85 p. c. ; sparingly in absolute alcohol; by dry distillation, it yields sulphuretted hydrogen, sulphur, and a volatile oil, which does not act upon potassium. The solid black residue possesses the same properties, excepting that it is richer in carbon and sulphur and less soluble. The distillate consists of two layers, the upper of which smells like peppermint, is very acid, and deposits sulphur after a while; after washing with soda, it is colourless, smells like thyme, is tasteless and neutral, burns like oil of turpentine, dissolves in all proportions in absolute alcohol, ether, and oil of turpentine, is not altered by nitric acid, turns greenish yellow, and gives off nitrous acid when heated with oil of vitriol and nitric acid, and is turned red by oil of vitriol. The lower layer of the distillate contains a very small quantity of a substance having an intolerable odour. (Boutigny.) When oil of turpentine is mixed by drops with a very large quantity of strong sulphuric acid, a red-brown solution is formed which deposits terebene when mixed with water; if, on the other hand, a very small quantity of sulphuric acid be poured into a larger quantity of oil of turpentine, the mixture becomes sensibly heated, blackens, and gives off a large quantity of sulphurous acid. (Gerhardt, Compt. rend. 17, 314.)
13. Oil of turpentine distilled with phosphoric anhydride, is resolved

into terebene and colophene. Glacial phosphoric acid turns the oil red.

(Deville.)

14. Boracic acid, heated with oil of turpentine to 100°, alters its rotatory power. French oil of turpentine, having a lavo-rotatory power of 35.4, exhibits, after being heated with boracic acid to 100° for 130

hours, a lavo-rotatory power of 23.0. (Berthelot.)

15. Carbonic acid does not decompose oil of turpentine in the cold; but when a mixture of the vapour with moist carbonic acid gas is passed through a tube heated nearly to redness, carbonic oxide and water are formed, together with a thin liquid, resembling acetone and isomeric with cymene. (Deville.)

$$C^{20}H^{16} + 2CO^2 = 2CO + 2HO + C^{20}H^{14}$$
.

16. Oxalic, tartaric, citric, and acetic acid do not act upon oil of turpentine at ordinary temperatures, but, at 100°, they alter its specific gravity, rotatory power, odour, and boiling point, and some of its chemical properties, in various degrees, according to the duration of the action. (Berthelot.) French oil of turpentine of lævo-rotatory power 35.4°, exhibits, after being heated to 100° for 73 hours, with crystals of oxalic acid, a leevo-rotatory power of 15.2°; with crystals of tartaric acid, levo-rotatory power=28 6°; with aqueous acetic acid, lævo-rotatory power=31.3°. English oil of turpentine, of lavo-rotatory power 18.6°, exhibits, after heating to 100° for 30 hours with crystals of oxalic acid, dextro-rotatory power = 16 2°; with glacial acetic acid, dextro-rotatory power = 14.7°. (Berthelot.) Berthelot, by heating oil of turpentine to 100° for 63 hours with oxalic acid, and subsequent distillation, obtained undecomposed oil of turpentine, a distillate smelling of terebene and exhibiting lavo- as wer of 16.8° to 35.4°, and, lastly, a viscid, yellow, non-Transmit Listillate, together with a solid residue. Oil of turpentine, and the specific acid at a high temperature, exhibits the boiling point of Berthelot.) When oil of turpentine is distilled with is a state acid, terebene, and colophene. (Deville.)

and the hydroduoric acid imparts but a faint yellowish colour and throws down a start to a start and a s we substance, amounting to about $\frac{1}{3.34}$ th of the oil, which is quickly acid pungent odour, which is quickly to the air, the oil then becoming decolorised and the rotatory power remains contains but little fluorine (3.05 p. c.), and the state of the state in the cooled leaden vessel rapidly absorbs the with the seed from 13 pts. fluor-spar by 3 pts. oil of vitriely when left at rest into two the second with its brown and furning, while the lower is ally, water, dissolves in ether and in oil of turpenti is rescal, with separation of white flocks which cooling, yellowish flocks which are me the stations, even after concentration and coding ्द्र ः araltered oil from leaden retorts, a fuming वौ . . . camphor, while, by distillation from glass 💌 🚉 🚉 stalline sublimate is obtained, having 🛎 with a tist-ting of a mixture of fluoride of silicius t. . the camphor-smelling oil just mentioned, * :: . wmains, after evaporation of the ether, se sie in m Suerine. (Reinsch, J. pr. Chem. 19,

is some in the cold, 6.8 p. c. of gascous marile of - : : : an isomeric, iridescent, viscid liquid, rat 300, and has no rotatory power. — Oil see tube with 2 vols. (167) of gaeous secures red, and becomes heated to the . . . : gas : the heat thus developed is in the union of the oil with the fluoride same tube is not converted into star-

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terres oil of turpentine partly into :. artificial camphor. (Deville.) -Subcran & Capitaine.) According is not any my use oil of turpentine, but units . T.

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variation 1: water, 200 pts. chloride of high is when distilled, a pleasant etheral a regression try of carbonic acid, froths up, and yields but the fire has been removed, a distillate which separates into three layers, the uppermost of which is undecomposed oil of turpentine, the middle, an aqueous solution of chloroform, while the lowest consists of chloroform. (Chautard.) — Hypobromous acid distilled with oil of tur-pentine, yields bromoform. When bromine is dropped into a thin paste of lime, as long as it is thereby decolorised, the mass becomes heated and thickened. If it be then brought back to its original consistence by addition of water, carefully mixed, during agitation, with a quantity of oil of turpentine equal in weight to half of the lime employed, and heated, a brisk action begins, though less violent than with chloride of lime, carbonic acid escaping and aqueous bromoform distilling over.

23. Liquid sulphide of phosphorus converts oil of turpentine, after some months' contact, into a viscid, yellowish red resin which surrounds the sulphide of phosphorus, rendered very limpid and somewhat more mobile by the action. Sulphide of phosphorus takes fire under boiling oil of turpentine. (Böttger, J. pr. Chem. 12, 359.)

24. Chlorochromic acid sets fire to oil of turpentine. (Thomson,

Phil. Trans. 1827; Pogg. 31, 607.)

25. Potassium does not act upon oil of turpentine in the cold, (Blanchet & Sell; Dumas.) It colours the oil brown and separates brown flocks without evolution of gas. (Deville, Hagen.) Potassium oxidises in oil of turpentine, gives off gas, and becomes surrounded with a thick resin. (Oppermann.) The oil of of the branches of the spruce fir, evolved hydrogen in a few minutes when treated with otassium, formed a light brown jelly, and was itself coloured brown because it con-

tained an oxygenated oil. (Wöhler.)

26. Fused hydrate of potash colours ordinary oil of turpentine (with separation of brown flocks, according to Deville), but not Venetian oil of turpentine. (Scharling.) To the oil from the branches of the spruce-fir, it imparts, on distillation, the odour of ordinary oil of turpentine. (Wöhler.) — Common oil of turpentine is coloured by hydrate of potash, the more strongly the older it is, and may become heated to 60° at the same time. — Both ordinary and Venetian oil of turpentine, when shaken up with bisulphide of carbon and fused hydrate of potash, yield after a while, a white saline mass which behaves like xanthate of potash.

(Scharling.)

Strong potash-ley does not alter oil of turpentine from the spruce-fir or Scotch fir (Wöhler, Hagen), or Venetian oil of turpentine, when distilled therewith, inasmuch as the distillate exhibits the same behaviour as before towards hydrate of potash and bisulphide of carbon. (Scharling.) It colours the common oil yellow and gradually brown. (Blanchet & Sell.) — A mixture of strong potash-ley and oil of turpentine separates into three layers; the uppermost of which is an oil, the lowest, potash-ley, while the middle layer is brown, thick, and soluble in potash-ley if weaker than the ley originally used From this milky solution, acids throw down a viscid resin which floats on the surface, and another which falls to the bottom in lumps and flakes, both being soluble in alcohol and having an acid reaction. The liquid resin becomes yellow and brittle after the adhering oil has evaporated. (Polex.)

27. Oil of turpentine absorbs 71 vols. ammonia gas at 16° (Saussure), acquiring a yellowish colour, but retaining its mobility. (Gehlen.) It forms a tallowy mass. (Saussure.) The milky liquid produced by agitating oil of turpentine with an equal quantity of aqueous ammonia separates, when left at rest, into three layers, the uppermost which is an oil, the lowest, a solution of sal-ammoniac, and the middle, a jelly like opodeldoe, which last, when separated from the liquid and pressed between bibulous paper, forms a mass which melts between the finger of when heated a few degrees above 0°.

28. Oil of turpentine takes fire with chlorate of potash and a fev drops of oil of vitriol, burning with a tremulous, very smoky flame and leaving charcoal. (A. Vogel Jun., Ann. Pharm. 74, 114.)

29. Quick line kept in contact for some time with crude oil of tu-

pentine, deprives it of its unpleasant odour. (Blanchet & Sell.)

30. Chloride of calcium, finoride of calcium, chloride of buries, chloride of strontium, include of ammunium and chloride of ammunium alter at 240°-250°, the rotatory power of oil of turpentine, and accelerate the very slow transformation which takes place at this temperature. (Bethelot.) — French oil of turpentine of lavo-rotatory power 35.4°, after being heated for 7 or 8 hours to 240°-250° with chloride of calcium, rotates 22.1° to the left; with finoride of calcium, 5.9° to the left; with chloride of strontium 184° to the left; — after being heated to 250° for two hours with chloride of calcium, 15.2° to the left; to 270° for two hours with chloride of calcium, 15.2° to the left; this last product is colourless and boils at 161°. English oil of turpentine, which rotates 18.6° to the right, exhibits after 7 or 8 hours heating to 240°-250°, with fluoride of calcium, a rotatory

power of 7.4° also to the right. (Berthelot.)

31. Chloride of Zinc does not act upon oil of turpentine at ordinary temperatures; but at 100°, it alters the rotatory power, retards the formation of turpentine-camphor, ultimately forms an oil containing C*H" and gives off hydrogen, increasing in quantity with the duration of the action, so that in 130 hours, from 15 to 30 volumes are evolved:—(C*H" = C*H" + 2H). (Berthelot.)—French oil of turpentine having a law-rotatory power = 35·4°, exhibits, after 130 hours heating to 100° with chloride of zinc, a lævo-rotatory power of 15·5°; English oil of turpentine of dextro-rotatory power 18·6°, heated for four hours to 100° with chloride of zinc, exhibits dextro-rotatory power = 17·85°. Oil of turpentine heated to 270° with chloride of zinc, becomes coloured, smells of terebene, and increases in density from 0.8613 to 0.8698 at 11°. French oil of turpentine heated to between 100° and 270° with chloride of zinc, yields when distilled at 160°, at first a distillate of apparently unaltered all of turpentine, of lævo-rotatory power 24·9° to 35·4°, then reddish coloured, and ultimately viscid oil having the boiling-point of colophent (Berthelot.)

32. Nitroprusside of copper boiled with oil of turpentine produce a green or bluish green precipitate. By this reaction, oil of turpentine may be recognised in oxygenated oils, which colour nitroprusside of copper black-brown or green and themselves acquire a darker colour. (Hepper production of the production of the production of turpentine production of turpentine products as a product of turpentine products are product of turpentine products as a product of turpentine products as a product of turpentine products are producted by the product of turpentine products as a product of turpentine products are producted by the product of turpentine products and turpentine products are producted by the product of turpentine products and turpentine product of turpentine products are producted by the product of turpentine products and turpentine products are producted by the product of turpentine products and turpentine products are producted by the product of turpentine product of turpentine products are producted by the product of turpentine product of turpentine products are producted by the product of turpentine product of turpentine products are producted by the product of turpentine product of turpentine product of turpentin

N. Br. Arch. 89, 57.)

33. Litharge or minium does not alter cold oil of turpentine (Branis, Müller), but, at a gentle heat, gives up oxygen to it, and converts it interebentic and formic acids. (Weppen.) Hydrated oxide of lend colors an equal weight of oil of turpentine dark red after a short time; with a smaller quantity of the hydrated oxide of lead, it turns yellowish after some days, the lead-compound itself remaining white. (Brandes.) Base acetate of lead, shaken up with an equal quantity of oil of turpenting forms, after a few minutes, a thick mixture, which varies in colour from orange-yellow to wine-red, is insoluble in water, but dissolves partially in alcohol, leaving a yellowish, viscid, acid mass, containing lead; with

excess of subacetate of lead, the colouring takes place more slowly and is weaker. (Brandes, Müller; comp. also Ozone with Oil of Turpentine, p. 275.) The altered oil is a mixture of acid resin with oxide of lead, adhering subacetate, and oil of turpentine; the latter separates transparent and colourless, only the subjacent basic acetate of lead exhibiting a red colour; a yellow solid body separates between the two layers of liquid. The colouring is not due to an acid resin contained in the oil of turpentine, inasmuch as it is likewise produced by oil, which has been purified with potash-ley. (Polex.) A concentrated solution of bibasic acetate of lead imparts a dark red colour in a few minutes to oil of turpentine four years old; with fresher oil, the same effect is produced in two hours; the same oil acquires the same colour by boiling with leadsolution for a quarter of an hour. (Schindler, N. Br. Arch. 41, 40.) Bassic acetate of lead is coloured reddish after a while by crude oil of turpentine, but not by the rectified oil or by the vapour; the crude oil loses these properties by boiling and distillation; the rectified oil acquires them by three months exposure to the air. When oil of turpentine is shaken up with basic acetate of lead in a bottle containing air, it takes up oxygen, which does not escape when the oil is boiled alone or with water, but if previously red, it becomes decolorised and deposits yellow flocks and white hydrated oxide of lead. (Brandes.) The crude mixture of 1 pt. alcoholic sal-ammoniac, 8 pts spirit of camphor, and 8 pts. oil of turpentine, mixed with 2 pts. basic acetate of lead, acquires a kermesbrown colour in a few minutes, and solidifies to a jelly after some days. (Buchner, Br. Arch. 8, 133.)

Interpolation.

Terebentic Acid, C18H14O10?

WEPPEN. Ann. Pharm. 41, 294.

Acide térébentinique. Terebentinsaure.

Formation. 1. By heating oil of turpentine with litharge. 2. By the action of the air on oil of turpentine mixed with oxide of lead, formic acid being produced at the same time:

 $C^{20}H^{16} + 14O = C^{18}H^{14}O^{10} + C^{2}H^{2}O^{4}$

Preparation. Oil of turpentine gently heated with oxide of lead, becomes coloured, absorbs oxygen with avidity, then again gradually loses its colour and deposits a copious yellow precipitate. This precipitate is boiled and washed with alcohol as long as the water runs off turbid, then decomposed by sulphuretted hydrogen, the terebentic acid dissolved out by alcohol, and the solution evaporated till it crystallises.

Properties. By slow evaporation it forms delicate white crystals; by quick evaporation, a brown tenacious mass. Its alcoholic solution reddens litmus.

							Kol	be.			
						a.		b.			
	18 C	108	****	53.46	*******	55.14		54.00			
	14 H	14	****	6.93	*******	6.97	242	6.93			
	10 O	80		39.61		37.89	****	39.07			
Ī	C18H14O10	202		100.00	********	100.00	****	100.00			

The acid used for the first analysis contained resin, formed in consequence of the temperature rising too high.

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and be not converted for the second of turp-name. In this compound part of the discrete vyour appears to be more intimately, a second port on an unitary to be latter may be transferred to other bodies, and still exhibits in properties of free example. Schönbein. — The formation of crowsed a left turp-nation takes place on agitating the oil with old air in presence of light, the action going on the more quickly, the more numerous the points of centart of the oil and the air, the brighter the light, and the lower the temperature. When, therefore, oil of turpenties is left for four months in a bottle, filled with air, and exposed to diffused daylight, the air being renewed as it is used up, a mobile, acid, oxidising oil is obtained.

Ozonised oil of turpentine exerts an oxidising action on the following substances. It decolorises indigo-solution when agitated with it, especially if the solution be warmed (hence if a portion of the ozonised oil be atroduced into a bottle, together with a strip of linen dyed blue with ligo-solution, the linen is bleached in a few hours). It converts

aqueous sulphurous acid, with rise of temperature, into sulphuric acid; colours solution of iodide of potassium immediately yellow, the oil at the same time becoming reddish, and, when heated, brownish yellow from separation of iodine (hence, when it is placed upon paper soaked in a mixture of iodide of potassium and starch, the paper turns brown, or, if moistened with water, blue). It converts a hot solution of ferrous sulphate into ferric sulphate, which partly separates (basic salt) and partly remains in solution. Ozonised oil of turpentine colours white ferrous cyanide containing potassium, blue; yellow aqueous solution of ferrocyanide of potassium, deep yellow, especially on boiling; converts arsenic spots on a porcelain plate into arsenic acid, and causes them to disappear completely in the course of 10 or 15 minutes (it does not affect antimony spots, even after a long time); decolorises sulphide of arsenic suspended in water, when heated and agitated with it; likewise sulphide of lead and strips of paper coloured therewith, if these papers are suspended in a bottle containing the ozonised oil. (Schönbein.) — This property affords the means of detecting oil of turpentine in other oils which do not ozonise the air. (Williams, Overbeck, N. Br. Arch. 90, 138.) — Ozonised oil of turpentine boiled with phosphorus, not in contact with the air forms phosphorus and Shaken an with finals. contact with the air, forms phosphorous acid. Shaken up with finely divided silver and a small quantity of acetic acid, it forms acetate of silver. It dissolves guajac resin, forming a solution which is colourless at first, but afterwards turns blue, especially when heated, the ozone combining with the guajacum under the influence of heat. The oxidising action of ozonised oil of turpentine is intensified by the presence of bloodcorpuscles and ferrous salts, the blood-corpuscles being thereby completely oxidised, and the protoxide of iron converted into sesquioxide. - A mixture of oil of turpentine, containing 2 per cent. of ozone with a solu-tion of subacetate of lead, acquires, when shaken up at mean temperature, a lemon-yellow to red-yellow colour, and forms protoxide and bioxide of lead, the greater portion of these oxides separating at once, while a smaller portion remains and separates from the filtered oil after 24 hours, so that the oil is but slightly coloured by the peroxide of lead, but nevertheless continues to exert an oxidising action. The strongest colouring takes place in a mixture of 1 vol. solution of subacetate of lead (leadvinegar, viii, 314,) and 2 vols. ozonised oil of turpentine; but peroxide of lead containing protoxide is likewise formed with every other proportion of the mixture.

Ozonised oil of turpentine sometimes also exerts a reducing action. -It abstracts part of the oxygen from peroxide of lead (oil of turpentine free from ozone has no action on that compound), losing its ozone at the same time, and giving off a gas not yet examined. It decolorises tincture of guajacum which has been coloured by peroxide of lead; also the aqueous solutions of permanganate of potash and of chromic acid mixed with sulphuric acid. — Hence even strongly ozonised oil of turpentine does not become coloured when shaken up with a few drops of leadvinegar, inasmuch as the peroxide of lead formed in the first instance is quickly decomposed by the excess of ozone present.

Ozonised oil of turpentine is partially deprived of its peculiar properties by boiling. (Schönbein.) It recovers them again when exposed to the air, and the yellowish residue possesses twice as much bleaching power as the distillate, though no oxygen is given off. (Williams.)

Schönbein explains the simultaneous oxidising and reducing powers

of ozonised oil of turpentine, by assuming that peroxide of lead contains

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1 Turpentine camphor. ("H"O".

hand being bridge by the first character (Transmin), Topotion being bridge by the first character (Berselius, list), the first character is as a distinct composed; the first character of the first character of the miss of the first character of the first character of the miss of the first character of the first character of the first the first character of the fi

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crystallises out in a few days. Neither does alcohol convert oil of turpentine into the camphor. (Deville.) — A mixture of oil of turpentine with hydrochloric acid, spirit of horse-radish, or spirit of caraway, deposits turpentine-camphor. (Rammelsberg, Pogg. 63, 570.) — When the liquid which remains after passing hydrochloric acid gas for some time through oil of turpentine, and separating the resulting crystalline compound, is mixed with water, turpentine-camphor separates from it. (Hertz.)

Preparation. 8 pts. of oil of turpentine are left in contact for 2 or 3 days with 2 pts. of nitric acid of sp. gr. 1.25 to 1.3, and 1 pt. of alcohol of 80 per cent., the mixture being frequently agitated, then for a considerable time without agitation at 20° to 25°, whereupon two layers of liquid form, the lower consisting of nitric acid and alcohol, and the upper containing oil of turpentine, which in time becomes darker, and ultimately brown and opaque, and smells like hyacinths. After a few days, crystals appear at the surface of contact of the two liquids, increasing very quickly during the first fourteen days, then uniting in crystalline crusts, finally sinking to the bottom, and attaining to a larger size the more the mixture is kept at rest. The yellowish brown crystalline crusts (contaminated with a brown substance), are collected, left for a few days on bibulous paper, then pressed and dissolved in hot water; the solution is boiled with animal charcoal and filtered; and the crystals, which separate on cooling, are left to dry in the air. (Wiggers.) — As a portion of the turpentine-camphor is very apt to be lost by volatilisation during the solution of the crystals in hot water and the boiling of the liquid, or by the decomposing action of the adhering acid, it is better to press the crystalline crusts between paper, pulverise them, and dissolve them in warm alcohol; the turpentine-camphor then separates on cooling, while the oil and acid remain in the mother-liquor. By repeated crystallization, they may be obtained quite pure, and by spontaneous evaporation of the cold-saturated alcoholic solution, in well developed crystals. (List.)

2. A mixture of 4 vols. oil of turpentine, 3 vols. alcohol of 85 p. e., and 1 vol. nitric acid is left to itself for several months at mean temperature (Deville), in shallow vessels. (Berthelot.) — In deep vessels, the formation of the camphor is not completed for several years, whereas, if shallow vessels are used, crystals appear after an interval varying from 48 hours to a week, and in a few weeks their formation is completed.

(Berthelot.)

3. Hydrochloric acid gas is passed into oil of turpentine till the solid hydrochlorate begins to separate; the passage of the gas is continued for some time; the liquid then cooled and left to stand for a night; sufficient water is then added to make it cover the bottom of the vessel about an inch deep; the mixture, after being shaken, is left to itself for a while; and the crystals, which separate after some time on the sides of the vessel, or float upon the oil, are collected and purified. (Hertz.)

4. Oil of turpentine, in quantities of about 10 grammes, is left in contact for some time with nitric acid and acetone or butyric acid. (Berthelot.) Under these circumstances, the oil is sometimes wholly con-

verted into turpentine-camphor. (Berthelot.)

The quantity of turpentine-camphor obtained by these several methods varies with the constitution of the oil of turpentine used. Those kinds of turpentine-oil which yield much artificial camphor when treated with hydrochloric acid, likewise

yand the argest amount of the performance. Wagners, By Wigger's action temperature in years 2.3 years of the permue manipher: Proceedings temperature in the following of the Deville a method important of the performance in 3 months, 27 p.c.; it was proceed by the American of the temperature in 3 months, 27 p.c.; it was proceed by the American of the temperature in two months yields quantities which may amount to 2.4 to the Elements.

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Invested seed to ment be-campled is converted by loss of water, into making a survey of re-complet. — I hydrody of only turpentine (Deville). For only the loss of the relation is been seed to the control of the relation of the property of the later of the later of the loss of the later of t mostine remains for several layer up, and amorph was but solidified the reveal to be the the training of a sharp doly, or heated to M, in termined upon or trought in a train with water, alcohol, or ether

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	<u></u> :	. ::-	12.95	. 11.68	11.8
•	. ::	. • •	17.54	18.73	18.4
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	Vы.	Density.
Compour :	. :)	8-3200
H ms	29	0-1386
ina High	2	2-2186
Violatic Timestal and the		10:6772
TACTOR OF THE STATE OF THE STAT	_	3-3356

The role was the American prior relatives on red-hot cals in the flame of a carilla will enter a to burn (Geiger) with a very flame Thomasi of a recording to Buchner, the combustion destinae. It leaves a small quantity of easily combustible charcal)—2. Described with analysis is phospheric acid, it yells and colophere. Devilled—The station obtained by hearing

turpentine-camphor with an equal weight of deliquesced glacial phosphoric acid, yields by distillation an aqueous distillate probably containing acetic acid, on which a light yellow aromatic oil floats, and leaves a brown tumefied residue.

3. Oil of vitriol dissolves turpentine-camphor with red colour (Boissenot & Persot), without heating (Trommsdorff), water being separated and terpinol produced, which forms a yellowish red mass with the oil of vitriol. (List.) The solution has a balsamic odour, like that of artificial musk; gives off acid vapours (Buchner); becomes limpid after a few hours, and yields pointed crystals (Voget); and deposits resin on being mixed with water. (Boissenot & Persot.)

By boiling turpentine-camphor with dilute sulphuric acid, or with

By boiling turpentine-camphor with dilute sulphuric acid, or with aqueous bisulphite of potash, or with aqueous sulphurous acid, terpinol is produced (List); likewise, though more slowly, by the action of aqueous exalic acid, tartaric acid, bitartrate of soda, or benzoic acid. (List.)

- 4. Hydrochloric acid gas converts turpentine-camphor, with separation of water, into solid bihydrochlorate of turpentine-oil (Deville); into a liquid compound of hydrochloric acid and oil of turpentine, isomeric with hydrochlorate of terebene (Wiggers), which, however, according to List, is a solution of artificial camphor in terpinol. Pulverised turpentine-camphor absorbs hydrochloric acid rapidly; deliquesces, with rise of temperature, to a brown liquid in which heavy drops first separate, and afterwards crystallise, so that it solidifies and must be warmed in order to pass hydrochloric acid gas through it; the liquid, after saturation, solidifies in the crystalline form, leaving only a small quantity of hydrochloric acid. (List.) The solution of turpentine-camphor saturated while warm with hydrochloric acid gas, separates into two colourless layers, the lower of which is concentrated hydrochloric acid, and the upper a compound of oil of turpentine with hydrochloric acid. (Wiggers.) Bihydrochlorate of turpentine-oil likewise forms in a mixture of turpentine-camphor and moderately strong hydrochloric acid. (List.)
- 5. Hydriodic acid, either gaseous or aqueous, converts turpentinecamphor into terpinol. The first product of the action is an iodated oil which, however, is completely decomposed by distillation, either alone or with water. (List.)
- 6. Turpentine-camphor dissolves without decomposition in cold nitric acid, the solution often beginning suddenly to boil (Trommsdorff); it gradually turns yellow when heated and gives off nitrous gas. (List.)—It deposits a yellow resin, and ultimately small yellowish crystals. (Trommsdorff); it smells like anise or fennel oil and rock-oil, and at higher temperatures, like camphor (Brandes); it emits an odour like that which is produced when a mixture of oil of turpentine and nitric acid takes fire. (Boissenot & Persot.)

7. When the vapours of fused turpentine-camphor are passed over wide-lime heated above 400°, terebentilic acid (xiii, 118) is obtained, together with marsh-gas and hydrogen:

 $C^{20}H^{20}O^4 = C^{16}H^{10}O^4 + 2C^2H^4 + 2H.$

(Personne, Compt. rend. 43, 553; Ann. Pharm. 100, 253.)

. Vien intermine mining a leasest to 250 with milde of unit out the mining a self in rest two layers are formed, the artist a new mining of animonalism with a few products of the interminant in the interminant of the products of the interminant in the interminant of the interminant in the intermin

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now are swelled in that a minute and impendiced temperature complex.

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The coveries are half at itel ling and I line broad (I to 2" long and iterative rates at lateral faces are longitudinally strated. Businest A French title lateral faces are longitudinally strated. Businest Harles than given in Tremmsdorff.)—Sp. gr. 1994. Transless In value very clief vitriol, they become dull, opaque and give off 2 An water Deville): 9:423 p.c. Aq. (List.) (Calcium C-H. 2-1Ap. = 3:7 Ap. also when heated to 100°. (Deville). This community melts when heated, and gives off water above 13 Haffier, fell w 100°. List, at 103 - 105° Deville), (according to List, the accounted translationary and solidifies on cooling to a milk-white, indistinctly crystalline mass of anhydrous turpentine-camphor. (Wiggers)—Crystallised turpentine-camphor dissolves readily in heated out whether the 1 cr whether Trenmsdorff, Buchner); from a warm solution in turpentine—1, it does not separate on cooling (Häfner, Brandes), but om a solution in 1 1755-31 the separation takes place. (Hafner)—sording to Veget, it is insoluble in oil of turpentine and in oil of almonds.

			8	Dumas Peligo		Wiggers.		Deville.	R	ammels.
20 C	120	 63.16		63.8		63.31		63.2		64.05
22 H	22	 11.58		11.4		11.55		11.7		10.61
60,	48	 25.26	·	24.8	****	25.14	****	25.1		25.34
C20H20O4 + 2Aq	190	 100.00		100.0	ine	100.00	2016	100.0	1411	100.00

The turpentine-camphor analysed by Rammelsberg had not been recrystallised. According to Berzelius, it is the hydrated oxide of a radical C20H17.

b. Aqueous Turpentine-camphor. Crystallised turpentine-camphor dissolves in 200 pts. of cold water (250 pts. according to Voget) and in 22 pts. of boiling water (24 pts., Trommsdorff; 30 to 36 pts., Voget), and separates in the crystalline form from the hot solution on cooling. (Buchner, List.) Commercial turpentine-oils form turpentine-camphors of various degrees of solubility in water. (Bertbelot, N. Ann. Chim. Phys. 40, 40.)

Turpentine-camphor dissolves in hot aqueous ammonia (Brandes); it dissolves in dilute aqueous alkalis, but when heated in concentrated

aqueous alkalis, it melts without dissolving. (Trommsdorff.)

It dissolves in 8—10 pts. of ether. (Voget.)
It dissolves at 10° in 7 pts. of alcohol of 85 per ceut., in 10 to 12 pts.
of 86 p. c. alcohol, and in 5—6 pts. of boiling alcohol. The solution of anhydrous turpentine-camphor in alcohol yields crystals of the hydrated compound. (Deville.) According to some statements, the solution becomes turbid when mixed with water; according to others, it does not.

Turpentine-camphor dissolves in acetic acid. (Boissenot & Persot.)

The solution is not rendered turbid by water (Brandes); when mixed with water, it deposits unaltered turpentine-camphor. (Trommsdorff.)

B. The so-called Liquid Turpentine-camphor.

 $C^{20}H^{18}O^2 = C^{20}H^{16}, 2HO.$

Monohydrate d'essence de térébenthine. (Deville.) Bihydrate d'essence de térébenthine. (Berthelot.)

A mixture of oil of turpentine and alcoholic nitric acid for the preparation of solid turpentine-camphor having been kept for three months excluded from the air, and then exposed to the air, did not deposit any solid turpentine-camphor, but on addition of water, yielded liquid turpentine-camphor in the form of an oil, which, after being distilled, was found to be C⁵⁰H¹⁸O². (Berthelot.) The same liquid turpentine-camphor is constantly produced in the preparation of the solid camphor, as described at page 259, 2, the mother-liquor which remains after the separation of the solid compound, yielding by distillation, between 200° and 220°, a liquid product which turns the plane of polarisation to the left, and appears by analysis to be a solution of solid in liquid turpentine-camphor. (Berthelot.)

The liquid compound acts on polarised light like oil of turpentine.

Rotatory power to the left = 42.4°. (Berthelot.)

					Deville.	3	Berthelot,
2		123		77-9	 76.4		78-2
14 H					11.6		
10 L		: 5	-	16-4	 12.0		9.7
C#E #0	2	134		1:0.0	 100-0		100-0

In the street of which it appears to be capable of passing, under circumstances not precisely understood, into solid turpentine-camphor. Hydrochlorate in and gas converts it into bihydrochlorate of turpentise-till.

C. Terpinol.

4.3 H 4.H O or C#H20,2HO.

Ministrative Conserver in Manhautters. (Berthelot, Gerhardt.) First prepared by Wiggers, examined and named by List.

Figure 2. I. From the entire camphor (p. 258). a. By the action of hydroce and Wigners. — i. By continued boiling of the aqueous solution with the structure acids, in smaller quantity also by the weaker acids of tarratio exalle, benefic or sulphurous acid, acid sulphate of yetash fractitation is also acids. (List) — c. By heating the camphor with the first that the continue of calcium, fluoride of calcium

Contract by its of an invertee the billing point; the supernatant of which firms it is a small vashed and rectified with water, and delydinged by equation with chieffed of calcium. (Wiggers)—the beta points schuld be the calcium campbor is treated with a small quartity of hydrollational at with a drop of oil of vitriol to 11.5 gm. of the torpositive campbor is the turbid mixture is distilled, and rectified with water containing hydroclaric acid if it contains unaltered oil of turpositions the cil which has passed over is dehydrated with chloride of calcium; and the person which in the rectification goes over at 168, is decanted and collected. List?

Properties Colourless, strongly refracting oil. (Wiggers.) Sp.gr. 0.802. Boiling point 168. (List. Has an agreeable odour of hyacinths, especially when much diluted. (List.)

			Wiggers	List.	Berthelot.
20 C .	. 120	527	82.53	_	
17 H	17 . 8		11 61 5 41		
		1000	16.00	100.00	100-0

gording to Berzelius, it is the exist of a radical Co Har.

Decompositions. 1. Distilled with acid chromate of potash and sulphuric acid, it yields acetic acid. 2. With hydrochloric acid gas, it assumes an amethyst-red colour, ultimately becoming darker; on continuing the passage of the gas, crystals of bihydrochlorate of turpentine-oil separate in such quantity that the liquid becomes nearly solid. The same reaction is produced by moderately concentrated aqueous hydrochloric acid. (List.)

3. With Hydrochloric Acid. Oil of turpentine absorbs, with rise of temperature, 50 per cent. of hydrochloric acid gas (Thenard), 163 vols. at 22°, and 0.724 met. atmospheric pressure.

A. Monohydrochlorate of Turpentine-oil. Artificial Camphor. C**H**, HCl.

Salzsaures Terpenthinöl; fester künstlicher Chlorcampher; salzsaures Dadyl (Blanchet & Sell); salzsaures Camphen (Soubeiran & Capitaine, and Deville); Hydrochlorate de camphène (Laurent); Monohydrochlorate solide d'essence de térébenthene. (Gerhardt.) Discovered in 1803 by Kindt, first described by Trommsdorff, investigated by Cluzel, Chomet & Boullay, afterwards by Dumas and others.

Formation. 1. By the action of hydrochloric acid gas an oil of turpentine (Kindt, Trommsdorff), or, on a solution of 1 vol. oil of turpentine in 2 vols. bisulphide of carbon. (Berthelot.) Hydrochlorate of terebene is formed at the same time. (Soubeiran & Capitaine.)—2. When 1 pt. of the liquid product obtained by saturating with hydrochloric acid gas a mixture of 1 vol. oil of turpentine and 2 vols. chloroform or acetone, creosote, acetic acid, butyric acid, butylate of ethyl, olein, oleic acid, or fusel-oil (or by saturating with hydrochloric acid gas, oil of turpentine altered by oil of vitriol), is treated with 5 pts. of nitric acid, a violent action takes place, sometimes giving rise to explosion; and when it is ended, artificial camphor is found as a sublimate in the neck of the retort. (Berthelot.)—3. By heating chlorinated oil of turpentine. (Deville.)

Preparation. 1. The gas evolved from 1 pt. of decrepitated common salt and ½ pt. oil of vitriol, is passed through 1 pt. of oil of turpentine, which thereby becomes yellow and transiently turbid, deposits red drops of liquid, then becomes very hot (without rise of temperature, according to Kindt), acquiring a darker and ultimately a red-brown colour; it is to be set aside cold for 24 hours, and the resulting crystals separated from the acid mother-liquor. (Trommsdorff.) The oil must be well cooled; it increases in bulk by ½ th. (Cluzel.)—2. Dry hydrochloric acid gas is passed to saturation into rectified oil of turpentine cooled from without, and the crystalline masses which separate after some hours are collected. (Oppermann.)

(Oppermann.)

The portion of the oil which remains liquid is not converted into artificial camphor on continuing the passage of the gas (Trommsdorff, Oppermann), but deposits a small additional quantity of it when cooled to -10°. (Soubeiran & Capitaine.) The crystalline mass formed by the hydrochloric acid gas is dissolved or converted into a viscid oil by the portion which remains liquid, even at -5°; the liquid must, therefore,

be quickly decanted from the crystalline mass, and the latter left to drain at a low temperature. (Hertz.) The most abundant formation of artificial camphor by the action of hydrochloric acid gas, takes place between — 30° and + 35°; within these limits, the crystals, produced are always the same, though they vary in quantity; below — 30°, and at + 60° and + 100°, no crystals are produced. (Berthelot.)

Purification. 1. Artificial camphor is freed from adhering mother-liquor, first by draining, then by pressure (Trommsdorff), or it is exposed to the air (Thénard), or washed with water or aqueous potash (Cluzel); washed with alcohol and dried by exposure to the air. (Dumas.)—2. It is sublimed: either alone, or repeatedly with 2 pts. of carbonate of lime (Trommsdorff), three times with hydrate of lime (Gehlen), or with an equal quantity of dry ash or porcelain clay, or charcoal powder (Cluzel); with chalk and chloride of calcium at 30—40. (Oppermann.)—It decomposes when sublimed either alone or mixed with chalk or quicklime. (Dumas.)—3. By recrystallisation from alcohol. (Gehlen.) By drying the washed crystalline mass in the water-bath, and subliming it at 100 mixed with burnt lime (Blanchet & Sell), by melting the expressed crystalline mass in the oil-bath. (Dumas.)—4. By precipitating its alcoholic solution with water, washing the precipitate and drying it in the oil-bath till it melts, or in vacuo. (Dumas.)—5. By boiling its solution with oxide of silver till the adhering hydrochloric acid is removed, cooling the concentrated and filtered solution, and drying the separated crystals in vacuo. (Dumas.)

Artificial camphor is a mixture of isomeric bodies which differ only

Artificial camphor is a mixture of isomeric bodies which differ only in their optical characters, and correspond to the different isomeric compounds used in their preparation, each of which produces only one artificial camphor distinguished by peculiar optical properties. (Ber-

thelot.)

The quantity of artificial camphor obtained varies according to the origin of the turpentine-oil used in its preparation. — Oil from the Scotch fir yields but slowly ā small quantity of artificial camphor (Hagen); that from the branches of the spruce fir, after treatment with potassium, yields none, even at 0°. (Wöhler.) Oil of turpentine heated with oxalic acid to 100° for 130 hours, still yields artificial camphor; but the last products of distillation of a French oil of turpentine which passed over between 240° and 280°, yielded none. (Berthelot.) — Trommsdorff obtained 26.5 p. c. artificial camphor; Cluzel 47; Oppermann more than 50; Berthelot obtained 51 p. c. at 0°, 67 at 35, Dumas 100°; Thénard, 110 per cent.

Properties. White, semi-transparent flocks (Trommsdorff), without crystalline form (Blanchet & Sell); when obtained by sublimation, it forms needles united in tufts (Cluzel), bright feathery, shining lamina, which may be kneaded like wax. (Oppermann.) — Melts at 115°, boils at 165°, but not without decomposition. (Blanchet & Sell.) — Rotatory power right or left and of various strength, depending upon that of the oil of turpentine from which it has been prepared. (Berthelot.) The rotatory power calculated for a specific gravity = 1 is 34.07° to the left. (Souberran & Capitaine.) Prepared from a sample of French oil of turpentine distilled between 80° to 100° in vacuo, it had a rotatory power = 23.9° to the left; from the distillate of the same oil which passed over above 100°, it rotated 23.9° to the left; from the last distillate of the same oil, 22.3° to the left. The artificial camphor prepared from the

most volatile portion of a sample of English oil of turpentine, had a rotatory power = 9.9° to the right; from the less volatile = 4.2 to the right; prepared from American oil of turpentine, 9° to the right. (Berthelot.) It smells like common camphor, sometimes also like turpentine; its odour is generally less powerful than that of camphor. Its taste is aromatic, but not so pungent and bitter as that of camphor. — It does not redden litmus.

						Dumas.		Blanchet & Sell.
20 C		120	****	69.6		70.35		70.2
17 H		17		9.9	Allens	9.95		10.0
Cl		35.5		20:5		19.85	****	19:5
C20H16	,HC1	172.5		100-0		100.15		99.7

The hydrocarbon which, in combination with hydrochloric acid, forms artificial camphor, is a peculiar constituent (called dadyl by Blanchet & Sell,) existing ready formed in the oil of turpentine (Thénard), having a composition different from that of common oil of turpentine (Oppermann), richer in hydrogen. (Gehlen.) Under the influence of hydrochloric acid upon oil of turpentine, camphene is produced, which unites with the hydrochloric acid to form artificial camphor. (Soubeiran & Capitaine.) Oil of turpentine unites with hydrochloric acid without previous alteration. (Deville.) Artificial camphor is C²⁰H¹⁵Cl,H², the hydrogen-compound of chlorinated oil of turpentine. (Gm.)

Decompositions. 1. Artificial camphor when heated, partly sublimes unaltered, and is partly decomposed, with evolution of hydrochloric acid gas. (Gehlen, Thénard, Dumas) It may be set on fire in a candle-flame (Saussure); it burns, even floating on water, with a green-edged flame, giving off hydrochloric acid. (Trommsdorff.) - When it is distilled, or when its vapour is passed through red-hot tubes, a large quantity of hydrochloric acid gas is evolved. (Gehlen, Thénard.) — 2. It decomposes but slightly with water or absolute alcohol at 170°, completely with a larger quantity of aqueous alcohol at 135°, or when repeatedly heated with 60 p. c. alcohol to 150-160°, forming hydrochloric acid, a small quantity of gas which burns with a greenish flame, and an oil precipitable by water. (Buttlerow, Chem. Centr. 1856, 406.)—3. Heated with oil of vitriol, it is dissolved, with evolution of sulphurous acid. (Blanchet & Sell.) - 4. Chlorine gas converts it slowly, and with slight evolution of hydrochloric acid, into a liquid which is coloured yellow by chlorine, and easily decomposes, often with explosion, into hydrochloric acid and crystallised chlorinated oil of turpentine. (Deville.) — 5. Ordinary nitric acid neither dissolves nor decomposes artificial camphor (Cluzel); concentrated nitric acid dissolves it, forming a red-brown solution which gives off nitrous gas (Oppermann, Blanchet & Sell), as well as chlorine. (Thénard.) It is rendered turbid by water. (Cluzel.) - 6. Heated with alcoholic potash to 150-160°, it decomposes slightly, with formation of chloride of potassium. (Buttlerow.) Potash abstracts from its alcoholic solution a small quantity of hydrochloric acid. (Thénard, Oppermann.) - 7. When the vapour of artificial camphor, mixed with ammonia gas, is passed through red-hot tubes, a volatile oil is formed, together with charcoal. (Blanchet & Sell.) — 8. When it is distilled 5 or 6 times with time, or when its vapour is passed over red-hot lime, the products are chloride of calcium, water, and volatile campbilene. (Oppermann, Dumas.)—Sublimed with chalk or white bole, it yields an oil smelling of turpentine, a brown acid water, and hydrochloric acid gas; when sublimed with hydrate of lime, it yields a limpid oil which crystallises on cooling, and an acid limpid liquid. (Gehlen.)

2. Alcoholic sulphocyanide of potassium, when repeatedly heated with the alechelic solution of artificial camphor to 150-160°, converts it into and, which, on addition of water, deposits an oil having a disagreable allia seems odeur, and containing sulphur and nitrogen. Sulphocymide s for appears to act in like manner. (Buttlerow.) - 10. Chloride of the descriptors it at 100°, with evolution of a gas containing hydrochler and Berthelet. — 11. Its appears solution is not altered by

12. Hentel fir 3. -40 hours in scaled tubes with 8-10 pts. of dry source 2 pts. is error of solid to 240-250°, it yields camphene. (Berthelm, Phones and 47, 28, abstr. Ann. Phones. 110, 367; Instit. 1858, 32. Characteristics.

that a Art irial campler imparts its taste to water. (Clusel) — it has been depended in the control of the contro

B. Birving horse of Turpentine-oil. C"H",2HQ.

Des una company de l'Organis de Baracheron de l'entendre de térébenthème (Berthelet). En les companys de la la section de la communité. Communité de l'entendre de la communité de l'entendre de l'entendre de la communité de l'entendre de la communité de l'entendre de l'entendre de la communité de l'entendre de l'entendre de la communité des la communité de la communité de la communité des la communité de la communité des la com

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			1.	Deville	4	2. List.	3.	Berthelot.
20 C								
18 H								
C20H16.2HCl	209	 100.0		100.7		100.2	****	98.1

1 and 2 prepared from turpentine-camphor; 3, from turpentine-oil, by the action of hydrochloric acid gas.

Decompositions. The compound gives off hydrochloric acid when heated. (Deville.) — Boiled with water or alcohol (List), with alcoholic potash (Berthelot), it is resolved into hydrochloric acid and oil of turpentine. — When treated with potassium, it yields an oil having the odour of lemons. (Deville.)

With Hydrobromic Acid. — Hydrobromate of Turpentine-oil, C²⁰H¹⁶, HBr. Bromwasserstoff-saures Terpenthinol. Feeler Bromcampher. Bromhydrate de camphène. (Deville.) Monobromhydrate solide d'essence de térébenthine. (Gerhardt.)

Formation. When oil of turpentine is acted upon by hydrobromic acid, this compound separates in the crystalline form, while hydrochlorate of terebene remains in solution.

Preparation. Oil of turpentine is saturated with hydrobromic acid, and the mixture is exposed to the air so that the excess of acid may evaporate, and then cooled some degrees below 0°. The crystals which separate are collected, their quantity often exceeding that of the oil of turpentine used; the mother-liquor is left to drain at a low temperature, and the crystals are pressed between bibulous paper, recrystallised from alcohol, and again strongly pressed.

Properties. This compound exactly resembles artificial camphor in appearance, crystalline form, and odour.

					Deville
20 C	200		56·24 7·81	*******	56.06 7.95
Br			35.95		35.95
C20H16,HBr	217	1	100:00	******	99-96

It dissolves in alcohol, the solution, when exposed to the air, turning red from liberation of bromine. (Deville.)

With Hydriodic Acid. — Hydriodate of Turpentine-oil, C²⁰H¹⁶, HI. — Iodwasserstoffsaures Terpenthinol. (Löwig.) Iodhydrate de Camphène. (Deville.) Monoiodhydrate d'essence de térébenthine. (Gerhardt.)

Preparation. Hydriodic acid gas is passed into oil of turpentine, and the dark red, fuming, heavy liquid is freed from excess of acid by chalk, from excess of iodine by potash-ley, weak alcohol, or mercury, and from adhering water by chloride of calcium. (Deville.)

Colourless oil, which does not solidify even at several learness below 0, has a sp. gr. of 1:5097 at 15°, and turns the plane of polarisation to the left. The rotatory power cannot be exactly determined because the compound very soon loses its transparency. (Devilla)

					D	evill	e.
:		 120	 46-0	•	45.99	****	46-36
					6.35		
:		 12.	 47.6	******	47.66	••••	47.80
 =	. E.	 264	 100-0	•	100-00		100-72

It is a matter of twimpdate of temperatine-oil and hydriodate of terebene, both

a vicin as them. Dealer
The new ways. It decomposes quickly when exposed to the single-post agreement of the single-post and turning black. When heated, to you'de a new you'de lastificate, together with indine and hydriodic and a last of the single-post of the

We in hydrogers of the self of temperative forms a heavy oil which sakes to the former smalls of hydrograpic acid and camphor, may be then the excess of self by washing with potash-ley, but not by The state of the s

Fig. 8. it may assert the most of temperature, and the solution soliding solutions of the speciment of the mass, consisting of a loose compound The state of a section of the case of a loose compound to the state of the case of the cas

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170° in 1 pt.; the last-mentioned solution becomes, on cooling, tough, significant, and waxy. (Brandes, Ann. Pharm. 9, 300.)

glutinous, and waxy. (Brandes, Ann Pharm. 9, 300.)
Oil of turpentine dissolves resins and most volatile oils. It dissolves \(\frac{1}{10}\) of stearic acid (Braconnot), and, when mixed with alcohol, it dissolves almost any quantity of oleic and other fatty acids (Rousseau, J. Chim. med. 22, 310); it mixes with bisulphide of carbon (Lampadius), and

with chloroform. (Huraut & Larocque, Compt. rend. 26, 103.)
It dissolves in 7.4 pts. of alcohol, of sp. gr. 0.84, at 22° (Saussure);

(secording to Bouillon-Lagrange and Voget, the solution reddens litmus); in 12 pts. of alcohol, of 33° B. (sp. gr. 0.858), at 10°; in absolute alcohol it dissolves in all proportions (Blanchet & Sell); in 4 vols. alcohol of sp. gr. 0.83; in 5 vols. alcohol. (Auduard, J. Chim. méd. 19, 717).—5 vols. oil of turpentine mix with 1 vol. alcohol; the mixture is not clouded by water, and is but slowly deprived of its alcohol when water is poured upon the mixture. (Vauquelin, Berzel. Jahresbr. 1824, 3, 181.)—It dissolves in acctone more readily than in aqueous alcohol. Wood-spirit or alcohol, diluted with so much water as to render it incapable of dissolving oil of turpentine, dissolves it after addition of a small quantity of benzene. (Mansfield, Chem. Soc. Qu. J. 1, 263.)—Oil of turpentine dissolves in wood-spirit in all proportions, and water added to the solution throws down the oil with milky turbidity. (Gmelin.)

Oils isomeric with Oil of Turpentine.

A. Products of the transformation of Oil of Turpentine.

1. Camphene.

Berthelot. (1858.) Compt. rend. 47, 266; abstr. Ann. Pharm. 110, 367.—Inst. 1858, 52; Cimento, 7, 161; Liebig & Kopp's Jahresber. 1858, 441.

Formation and Preparation. — Monohydrochlorate of turpentine-oil heated with 8-10 parts of dry soap or 2 pts. benzoate of soda in sealed tabes to 240°-250° for 30 or 40 hours; and the product is distilled till white vapours appear, then rectified, the portion which passes over from 160° to 180° being collected and pressed between bibulous paper after solidification.

Properties. Crystalline, camphor-like mass, which melts at 46° and hoils at about 160°.

Platinum-black converts it into camphor (or a substance very much like it). With hydrochloric acid, it forms a crystalline compound (monohydrochlorate of turpentine-oil?) (Berthelot.)

2. Isoterebenthene.

BERTHELOT. (1853.) N. Ann. Chim. Phys. 39, 16; abstr. Compt. rend. 26, 428; Ann. Pharm. 88, 347; J. pr. Chem. 59, 141.

Formation. By continued heating of oil of turpentine under pressure.

Preparation. English oil it turned the Pieus Australis is heated for three hours to 300° m a senset three the portion which goes over below 200° is resistilled and remains. And the distillate obtained between 170° and 170° is remains.

Properties. This relatiness strongs refracting liquid of sp. gr. 0.5432 at 227, builting between 174 and 175 and inving a levo-rotatory power = 107 carring leasures will be mirror and measure of the battag and measures of the oil of three-mire used in the properties. It smells like still leaved-pools

		3	حتنشنت	
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<u> </u>		- 16114]		7-1

To prove it in power of sommoderniane is reliable from \$8 to a common nearly to a 100 for B. hours with a process with and a carbonic in a real inserts of the carbonic in a real inserts of the carbonic inserts of the carbo

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— la contratto do una maria de quien hydrocoma a local de mariana de lay drochlorate de la companio de la contrata del contrata de la contrata del contrata de la contrata del contrata de la contrata de la contrata de la contrata del contrata de la contrata de la contrata de la contrata del contrata del contrata de la contrata de la contrata del contrata d

21 = 2 CMMMHC1 = 21202ECL

among averaged or four vests it forms crystale continuous and of turnentine oil.

Language of turnentine oil.

3. Metaterebenthene.

S. MELOT. 1853.) N. Ann. Chim. Phys. 39, 19.

Securities. By the prolonged action of heat on English oil of terms. The pressure, the first product of the action being chiefly

When the product obtained in the preparation of the as above described, is distilled, and the liquid her the portion which distills below 250° has passed of, is

heated for several hours to 360°, and the portion which volatilises below 360° is distilled off, the residue consists of metaterebenthene, the quantity of it being greater in proportion to the time during which the oil of turpentine was heated.

Properties. Yellow, viscid oil, of sp. gr. 0.913 at 20°, and volatilising without decomposition above 360°. Has a strong and unpleasant odour, especially when heated.

Combinations. It absorbs in 33 days, 9.7 p. c. oxygen, gives off 0.3 p. c. carbonic acid, and assumes the consistence of colophony. - It absorbs only half as much hydrochloric acid gas as isoterebenthene, viz., 17.7 p. c. at 24° corresponding to the compound 3C20H16,2HCl.

4. Terebene.

BLANCHET & SELL. (1833.) Ann. Pharm. 6, 259.

DEVILLE. Ann. Chim. Phys. 75, 37; J. pr. Chem. 22, 82; Ann. Pharm. 37, 176; J. Pharm. 26, 655; abstr. Compt. rend. 12, 304; N. Ann. Chim. Phys. 27, 85.

SOUBEIRAN & CAPITAINE. J. Pharm. 26, 1.

BERTHELOT. N. Ann. Chim. Phys. 38. 42; further 39, 14 and 21; further 40, 5.

Formation. - 1. By distilling oil of turpentine with oil of vitriol or anhydrous phosphoric acid; also, together with colophene, by distilling crystallised or fused turpentine-camphor with anhydrous phosphoric acid. (Deville.) - 2. By the action of hydrochloric acid gas, hydrobromic acid gas, chlorine, bromine, or iodine, upon oil of turpentine, uniting however immediately with the acids or salt-radicals. (Deville.) — Only a portion of the oil of tarpentine is converted into terebene, which moreover cannot be separated without alteration from the compounds produced by the reaction. (Deville.) — No terebene is formed by the action of hydrochloric acid; for the hydrochlorate, which is formed in addition to the artificial camphor, possesses a rather strong rotatory power which pure terebene does not. (Berthelot.) This rotatory power is due to artificial camphor, which is always mixed with it. (Deville.)

Preparation. Oil of turpentine is mixed slowly and by drops with of oil of vitriol contained in a cooled vessel; the red viscid mixture is stirred and left to settle; the liquid is decanted, after 24 hours, from the black sediment produced at the same time by the acid, and distilled at a temperature not above 210°, whereupon sulphurous acid is evolved, and the colophene produced at the same time remains behind. To convert the still unaltered turpentine-oil in the distillate into terebene, it is repeatedly distilled with fresh quantities of oil of vitriol till the product has quite lost its rotatory power; and the distillate is washed with aqueous carbonate of soda, then with water, and dehydrated by chloride of calcium. (Deville.)

Properties. Colourless oil, resembling oil of turpentine, without rotatory power, and having a rather agreeable odour of thyme. (Deville.) VOL. XIV.

Sp. gr. 0.864 at 8°. Boiling point 156°. (Frankenheim, Pogg. 72, 422.) Latent heat for the unit of weight 67.2. (Frankenheim.) Refracting power 1.474 (Deville, Pogg. 51, 433), 1.479 (Becquerel & Cahours, Pogg. 51, 427). Vapour-density = 4.812 (by calculation 4.7144 comp. page).

				Deville.			
			88·24 11·76				
C20H16	*******	136	 100.00	 99.98	****	100.0	

1. Prepared from oil of turpentine with oil of vitriol.—2. From turpentine-camphor with anhydrous phosphoric acid.

Decompositions. The compound remains unaltered after two hours' heating to 300°. (Berthelot.) By chlorine it is converted, with evolution of hydrochloric acid, into chloroterebene; by bromine, with evolution of hydrobromic acid, into bromoterebene. (Deville.) — With a small quantity of iodine, it turns dark green, becomes heated, and loses its transparency, but does not deposit charcoal or give off hydriodic acid. When terebene is distilled with excess of iodine, hydriodic acid escapes, and an iodated viscid liquid distils over, which is easily decolorised by potash, and probably consists of iodoterebene. (Deville.) — When heated with oil of vitriol, it is converted into sulphoterebic acid. (Gerhardt, Compt. rend. 17, 314.)

Combinations. Terebene does not form a hydrate, even after half a year's contact with water. (Deville.) — It absorbs gaseous fluoride of boron without alteration. (Berthelot.)

With Hydrochloric acid.—a. Bibasic Hydrochlorate of Terebene. Sous-chlorhydrate de térébène (Gerhardt); Monochlorhydrate de térébène. (Deville.)—2C20H16,HCl.—Produced when hydrochloric acid gas is passed into terebene.— Mobile oil of sp. gr. 0.902 at 20°, without rotatory power; smelling strongly of terebene, and slightly of hydrochlorate of terebene. (Deville.)

40 C			20000		Deville. mean. 78.28 10.68
Cl				*******	20 20
2 C20H16, HC1	308.5	****	100.00	-	100.00

b. Hydrochlorate of Terebene. — Flüssiger künstlicher Camphor; salzsaures Peucyle (Soubeiran & Capitaine); salzsaures Peucyl (Blanchet & Sell); Bieklerhydrate de Térébène. (Deville.) Monochlorhydrate liquide d'essence de térébenthise. C²⁰H³⁶, HCl.

Preparation. From the liquid which remains in the treatment of oil of turpentine with hydrochloric acid gas, after the separation of the artificial camphor.—1. By distillation per ss (Blanchet & Sell), whereupon hydrochloric acid and a dark-coloured oil pass over, and charcoal remains. (Trommsdorff, A. Tr. 1, 2, 132,)—2. The liquid is heated for

a short time in the water-bath; the artificial camphor which separates on cooling is removed; the liquid is neutralised with chalk and cooled to — 10°, whereupon an additional quantity of artificial camphor separates, but not all. The liquid, which is syrupy in the cold, but very mobile at 15-18°, is decanted, mixed with 2 vol. alcohol, decolorised by boiling with animal charcoal, precipitated by water, and the oil which falls to the bottom is dehydrated by chloride of calcium. (Soubeiran & Capitaine.)

Properties. Colourless oil, of sp. gr. 1.017, boiling at 19.92° (Soubeiran & Capitaine), at 28°. (Berthelot.) Turns the plane of polarisation to the left. Refracting power = 1.4848. (Deville, Pogg.

51, 433.)

		-		abeiran & apitaine.
20 C 17 H	17.0	 69.6 9.9 20.5	*******	70·3 9·9 19·8
C20H16,HC1	-		*******	100.0

Isomeric with mono-hydrochlorate of turpentine-oil.

Decompositions. 1. When set on fire, it burns with a green-edged flame and an odour like that of benzoic acid. (Blanchet & Sell.)—2. When chlorine gas is passed into it, it gives off vapours of hydrochloric acid, and thickens like oil of turpentine treated with chlorine, but without depositing crystals like the latter. (Blanchet & Sell.)—3. Hydrochloric acid gas does not convert it into artificial camphor. (Cluzel, Ann. Chim. 51, 270.)—4. When hydrochlorate of terebene is distilled with hydrate of lime, hydrochloric acid and terebene are produced (Soubeiran & Capitaine); the product is a thin, aromatic oil. (Gehlen, A. Gehl, 6, 458.) No terebene is produced in this reaction, inasmuch as hydrochlorate of terebene cannot be freed from artificial camphor, even by repeated distillation and cooling; and moreover, the lime used in the reaction, or the temperature which it requires, exerts at the same time a decomposing action on the separated terebene. (Deville.)—5. Alcohol decomposes hydrochlorate of terebene, especially when heated with it, forming an acid product and an oil which is precipitated by water. (Blanchet & Sell.)

c. Hydrochlorate of Terebene with Bihydrochlorate of Turpentine-oil. C***PH**6,2HCl + 2 (C***PH**6,HCl.) The liquid which remains after the separation of bihydrochlorate of turpentine-oil, from a solution of the oil in alcohol or glacial acetic acid saturated with hydrochloric acid gas (p. 268), and that which is produced by the action of hydrochloric acid gas on isoterebenthene (p. 271), contains 24*3 to 25*7 p. c. chlorine, and may accordingly be regarded as a compound of 2 At. hydrochlorate of terebene with 1 At. bihydrochlorate of turpentine-oil; or as a compound of bihydrochlorate of turpentine-oil with artificial camphor, inasmuch as the former separates when the liquid is exposed to the air, perhaps after the volatilisation of the latter, and moreover artificial camphor and bihydrochlorate of turpentine-oil liquefy on being mixed. But the liquid produced from French oil of turpentine and glacial acetic acid yields, when treated with nitric acid, a large quantity of turpentine-camphor, and is therefore not identical with a mixture of artificial camphor and bihydrochlorate of turpentine-oil, which under these circumstances does not produce artificial camphor. (Berthelot.)

Hydrochlorate of terebene dissolves in alcohol and ether, and is precipitated by water. (Cluzel.) Full Experience in the formula is the action of hydrobromate of Terbene. Supermember in the formula is the action of hydrobromic acid upon actions.— Terminal summarial with hydrobromic acid is shaken up with mark to remove the annual them becomessed with animal charcoal and recognized to an other to mark the Colourless oil of sp. gr. 1021 at the without remaining power smaller like terebene, somewhat like mark to and terminal removed after a wille by exposure to the air. Therefore

_			••		Deville.
	i e i			********	63·63
1. E			9-35		9.53
3c	֓	_	22.5		
1 75 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	:::		100-00		

In the product of Product. — Mandrondy draft liquide d'essent le la consequence de la consequence del consequence de la consequence de la

<u> </u>	113		36-15	******	Deville 51-01
: E	17	_		****	7.53
32	. 89		36.02	*******	38.43
######################################	:::	_	100-00		100.00

Will Holly do thill— the Bibisis Hedricalate of Terebone.— See 19 for the Control of Microsofty dry ale de têrêtêne. (Desillet-See H. 1811.—Formed by the satisfied of hydricalic acid on oil of turpentine.— Hydrical charities also rised by the turpentine with rise of temperature. The free acids seemed in the cill, which is dark-red after saturation, by slaking it up with charks dissolved indine is removed by agistic mouth dilute putashiley, weak spirit, or mercury; and admixed water by cill ride of calcium.—Transparent, colourless liquid of sp. gr. 1984 at 21 t without retaining lower.— Has an agreeable camphores often, and quickly acquires a dark red colour by exposure to the sin (Poville)

				Deville.
40 C	240		60.59	 60.87
33 11	33		8-14	 8-14
1	127	••••	31.27	 30.19
2 C>H*,III	400		100.00	 99.50

b. Mono-hydriodate of Terebene. Monoiodhydrate liquide d'essence de térébenthine. (Gerhardt.) Bi-iodhydrate de térébène. (Deville.) C²⁰H¹⁶, HI. Produced, together with hydriodate of turpentine-oil, by the action of hydriodic acid upon that oil, but cannot be separated therefrom, inasmuch as both compounds are liquid. (Deville.)

Appendix to Terebene.

Sulphoterebic Acid.

C20H16S2O6 3

Terebenschwefelsäure, Terpenthinschwefelsäure. Formed by gently heating terebene with fuming oil of vitriol, or by dropping oil of turpentine, cubebs, pepper, lemons, or copaiba into a large quantity of oil of vitriol, but not so easily as terebene. (Gerhardt, Compt. rend. 17, 313; Compt. chim. 1845, 173.)

Sulphoterebate of Baryta. Prepared by heating terebene with oil of vitriol, saturating with carbonate of baryta, filtering, and leaving the solution to evaporate. (Gerhardt.)

20 C		120.0		42.8	G	erhardt.
15 H B		15·0 68·5	****	5·3 24·1		24.2
	03 15BaS2O6			-	1	-

5. Camphilene.

OPPERMANN. (1831.) Pogg. 22, 199.

DUMAS. Ann. Chim. Phys. 52, 400; Pogg. 20, 125; Ann. Pharm. 9, 56.

BLANCHET & SELL. Ann. Pharm. 6, 276; Pogg. 29, 133.

SOUBEIRAN & CAPITAINE. J. Pharm. 26, 1; Ann. Pharm. 34, 311.

LAURENT. Ann. Chim. Phys. 66, 209.

DEVILLE. Ann. Chim. Phys. 75, 74; J. Pharm. 26, 688.

Camphène (Dumas); Dadyl (Blanchet & Sell); Térébène (Soubeiran); Camphilène (Deville). — First prepared by Oppermann. — According to Dumas and Blanchet & Sell, it is the base of solid artificial camphor; according to Soubeiran & Capitaine and Deville, it is contained therein in combination with hydrochloric acid, but without alteration.

Formation and Preparation. 1. Artificial camphor mixed with 2—3 pts. of quicklime is distilled in the oil-bath; the distillate is again mixed with quicklime; the distillation is repeated five or six times in like manner (ten times, according to Oppermann, and Blanchet & Sell, or till the distillate no longer yields chlorine to potassium); and the resulting oil, amounting to 4ths of the weight of the artificial camphor, is freed from adhering hydrochloric acid by rectification over antimonide of potassium, which, however, is apt to climinate hydrogen (Dumas) and

form colophene. (Deville.) — 2. Vapour of artificial camphor is pased through a tube heated in the cil-bath to 190°—195°, and filled with fragments of recently bernt lime; the same operation is repeated with the distillate as long as it retains bydrochloric acid; and the product is dried over chloride of calcium. (Soubeiran & Capitaine.)

Properties. Transparent, colourless, or slightly yellowish oil (Blanchet & Sell); somewhat used (Opperman). Sp. gr. 0.87 at 15° (Blanchet & Sell), 0.86 (Soubeiran & Capitaine); boils at 145° (Blanchet & Sell), 156° (Dumas), 155° (Soubeiran & Capitaine). According to Oppermann, it solidifies below 12° to a transparent mass, which liquefies at the heat of the hand. (Oppermann.) — Vapour-density = 4.83. (Dumas.) It has no rotatory power. (Soubeiran & Capitaine, Deville.) Biotford that it had a hero-rotatory power seven times less than that of oil of turpentine; but according to Soubeiran & Capitaine, the campbilene which he examined contained undecomposed artificial campber. It has a mild aromatic taste and odour. It resembles oil of turpentine in all its properties, but has a different odour, not however arising from decomposition by heat, since the vapour of oil of turpentine retains its odour after passing through a tube heated to 200°. (Soubeiran & Capitaine.)

				0	pperman	n,	Dumas,		Blanchet. & Sell.
20 C									
16 H	16	-	11-76	-	11-52	-	11:56	-	11.26
Calla"	136	-	100-00	-	100-00	2000	100-00	****	100-17

Decompositions. Chlorine converts it, without evolution of hydrochloric acid, into hydrochlorate of chlorocamphilene:

$$C^{10}H^{18} + 2Cl = C^{10}H^{15}Cl,HCl.$$

which, when treated with alcoholic potash, yields chloride of potassium and chlorocamphilene. The latter, if again treated with chlorine gas, yields hydrochlorate of bichlorocamphilene, which may again be decomposed by alcoholic potash in the same manner as hydrochlorate of chlorocamphilene, yielding bichlorocamphilene, in which a further number of hydrogen-atoms may in like manner be replaced by chlorine. (Laurent) — Camphilene, treated with bromine, becomes solid, and is probably converted into bromocamphilene. (Deville.) With iodine, it comports itself like oil of turpentine. (Blanchet & Sell.) By oil of vitriol and by heating with potassium in contact with the air, it is decomposed, with formation of a brown resin. (Oppermann.)

Combinations. Campbilene is not dissolved or altered by faminy nitric acid (Oppermann); alcoholic nitric acid converts it into a crystalline hydrate. (Gerhardt, Traité 3, 625.) It absorbs hydrochloric acid gas rapidly, especially when heated, forming a solid (Oppermann), and a somewhat liquid compound, both destitute of rotatory power. (Sabeiran & Capitaine.) — Fuming hydrochloric acid, in contact with campbilene, forms many solid and a few liquid compounds. With hydrochloric acid, it forms a liquid compound. (Deville.)

Camphilene dissolves in alcohol, ether, and bisulphide of carbon, not in

acetic acid. (Oppermann.)

Appendix to Camphilene.

a. Colophene. C40H32.

DEVILLE. Ann. Chim. Phys. 75, 66; J. pr. Chem. 22, 158; J. Pharm. 26, 681; Ann. Pharm. 36, 102; abstr. Compt. rend. 12, 395.— N. Ann. Chim. Phys. 27, 85.

Formation. 1. In the distillation of oil of turpentine with oil of vitriol or anhydrous phosphoric acid, also of crystallised or fused turpentine-camphor with anhydrous phosphoric acid, terebene being formed at the same time. — 2. Goes off, together with water, in the rapid distillation of colophony, charcoal being separated at the same time.

Preparation. 1. By collecting apart the viscid yellow oil, which, in the preparation of terebene from oil of turpentine with oil of vitriol (p. 273), passes over after the terebene has been distilled off and the heat is raised, and repeatedly rectifying it, at last over antimonide of potassium, whereby it is freed from an impurity resembling colophony, and from sulphur. — 2. Colophony is distilled over a brisk fire, and the yellowish distillate is purified like that obtained by the first process. Colophene thus prepared is contaminated with a body richer in carbon, which is produced by the action of the antimonide of potassium, and cannot be separated from the colophene by distillation.

Properties. Oil, colourless by transmitted light, and exhibiting by reflected light a dark indigo-blue iridescence. Sp. gr. 0.940 at 9, 0.9394 at 25°. Boiling point between 310° and 315°. Vapour-density = 11.13 (probably only twice as great as that of oil of turpentine, therefore = 9.526). Refracting power = 1.517 (Becquerel & Cahours, Pogg. 51, 427), 1.5212. (Deville, Pogg. 51, 433.) Without rotatory power. Smells like campbilene.

					I	Devil	le.
					a.		6.
40 C	. 210	100	88.24	*******	88-43		88-1
32 H	32	***	11.76		11.59	****	11.9
C40H≥2	. 272	****	100.00		100.02	444	100.0

a. Prepared from oil of turpentine by oil of vitriol; b. from turpentine-camphor by anhydrous phosphoric acid.

Colophene absorbs chlorine gas, without evolution of hydrochloric acid, becoming hot, and changing to a resin like colophony, which separates in yellow spherules from its solution in absolute alcohol. If, when the absorption of chlorine has ceased, the product be heated to fasion in the stream of chlorine, a large quantity of hydrochloric acid is evolved, and Deville's chlorocolophene = C40Cl8H24 is formed, which however still contains a resin removable by alcohol, and when distilled, gives off hydrochloric acid, yields a distillate of colophene and hydrochlorate of colophene, and leaves charcoal.

Formula is temperature and at these in managements. Hydrocourse of temperature and at these in managements. Hydrotemperature of these gives in leading at its immediative and then these with small in. Then destroy at the immediative and then the state of the vicinity was not employ the distribution of exception, and in a relinating power for large = 10.7%. Therefore, Secured & language 2.5% for all this of

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From an That painwish all with while indexence, having a high bring point a militude and an above of whiles.

France harmed with congluent from all of impositive or few colors of

Burni vill a logita very smily fame.

Conference in the new soluble in parts or in weak alcohol, but have now new terminational and conjugate the first in the solution of investigation of alcohol, the solution are an annual new solution examined as fine dark blue colour by referred in figure.

6. Terebilene.

Tianguit & Seil. Ask Florm. 6, 259. Steeman & Caritaine. J. Phorm. 2, 61; Ann. Phorm. 34, 311. District. A. . C. v. Pije. 71, 74; J. Phorm. 26, 689.

Fig. 1. Dimensit & Sell's Tradifière (Scubeiran & Capitaine; Deville). The according to Earn last & Sell, is one of the isomeric hydrocarbons which these chomests is severed in all if turpentine. According to Soubeiran & Capitaine, it is a decomposition-product of penalylene, a body which they suppose to be formed from all of turpenine under the influence of hydrochloric acid; according to Deville, it is a product of the lecomposition of terebene see page 245).

Promoting and Proposition. By distilling hydrochlorate of terebere over quicklinne (Subsimu & Capitaine), and finally over potassium that A Sell, or by heating hydriodate of terebene with hydrate of and rectifying the resulting oil over antimonide of potassium, in free it from iodine. (Deville.)

Properties. Colourless mobile oil (Blanchet & Sell), of sp. gr. 0.86 (Blanchet & Sell, Soubeiran & Capitaine), 0.843 at 21°. (Deville.) Boiling point 134°. (Blanchet & Sell.) Vapour-density = 4.767 (Soubeiran & Capitaine; Deville), by calculation 4.7144 (p. 245). Refracting power = 1.479 (Becquerel & Cahours, Pogg. 51, 427); 1.4735. (Deville, Pogg. 51, 433.) Without rotatory power. Smells like terebene. (Soubeiran & Capitaine.)

_		-	-	1000	11:76	200000	_
	20 C .						

With hydrochloric acid, it forms a brown liquid compound. (Soubeiran & Capitaine.)

B. Natural Oils, or others related to them.

(Arranged for the most part in alphabetical order.)

1. Oil of Bergamot.

VAUQUELIN. (1817.) J. Pharm. 3, 241.

OHME. Ann. Pharm. 31, 316.

SOUBEIRAN & CAPITAINE. J. Pharm. 26, 68; abstr. Ann. Pharm. 34, 321.— J. Pharm. 26, 509; Ann. Pharm. 35, 313.

Essence de Bergamot.

Source. In peculiar cells in the rind of Citrus Bergamia.

Preparation. The cellular tissue of the fresh rind is torn to pieces in a funnel having its inner surface like a rasp, or on a board covered with teeth, and the oil which exudes from the lacerated cells is collected.

Properties. Yollowish, or pale greenish to dark yellow: after rectification with water, it becomes transparent, colourless, and mobile. (Ohme; Zeller, Studien über ätherische Oele, Landau, 1850.) — Sp. gr. 087—0888 (Lewis, Zeller), 0.556 (Ohme); after distillation with water, 0860. (Soubeiran & Capitaine.) The first portion obtained by distillation with water, has a sp. gr. = 0.850, the last, 0.877. (Soubeiran & Capitaine.) Boiling point 183° (Ohme); of the first distillate obtained with water, 195°. (Soubeiran & Capitaine.) It solidifies at a few degrees below 0°. (Lowis.) Refracting power 1.468. (Deville, Compt. rend. 11, 865.) — Rotatory power of the oil rectified with water, 25° to the right (of the first distillate, 45° right; of the second, 38° right; of the third, 21° right; of the fourth, 0°; of the mixed distillate, 26° right). (Soubeiran & Capitaine.) Of the first distillate, 49°.396 right; of the last, 6°575 left. (Biot, Compt. rend. 11, 371. — Has an agreeable odour, less after distillation, and a bitter taste. (Ohme.) The oil is neutral. (Zeller.) Sour from admixed acetic acid; neutral after distillation withwater. (Ohme.) The vapour of the acid-reacting oil has also a strong acid reaction. (Ohme.)

	Okase.		So	Soubeiran & Capitaine.					
			2		Ŀ.	•	e.		₫.
c	51.35	_			54-92		73.03		85-7
H	11:32	_	10-12		11:44		10-83	****	11.7
0	7:32	_	4-50		3.64		16.14		2.6
	1 (4)-(4)		190-00		100-00		100-00		100-0

e. First duriflute: i. first Estillate from all e. last distillate; d. first distillate

of the bergameterd with water.

Bergameterd w a hydrate of oil of lemon, $3C^{\alpha}H^{\beta}+4HO$ (Ohme); a mixture of several oils. Southern & Capitaine; W5hler, Ann. Phorm. 37, 137); it contains one or two oils of the formula $C^{\alpha}H^{\beta}$, a hydrate of the same, and an oxygenated oil produced by the action of the air. Southern & Capitaine.) It deposits bergaptene (p. 343) by keeping.

Decompositions. Bergamot-oil burns with a luminous flame. - 2. It dissolves indine with effervescence and evolution of vapours, varying in colour from vellowish-red to violet, and is converted into a soft mass. (Zeller.) — 3. Furning mitric acid colours it brown-yellow (Zeller); boiling nitric acid, bright green Bourstro), and ultimately converts it into a brittle resin. Zeller. — 4. Oil of vitrial turns it yellow without thickening it; afterwards dark red to black, according to the quantity of the acid, and gives off sulphurous acid. (Brandes, Mag. Pharm. 32, 79.) — 5. With an indrove prospheric acid, it becomes coloured and heated, and when distilled therewith, yields a colourless oil which smells like oil of turpentine,—rotates polarised light 4° to the right (40° to the right before distillation), combines with hydrochloric acid, contains 88°93 p. c. C and 11°52 H. and is isomeric with citrene. The phospheric and is at the same time partly converted into phosphobergamic acid. (Soubeiran & Capitaine. — 6. Bernamet-ill absorbs by brochloric acid gas with evolution of heat activities a brown colour and emitting fumes in the air, and if subsequently distilled with water, yields hydrochlorate of bergamot-oil. (Ohme. — 7. By distillation over hydrate of potash, it loses its agreeable clium. - 5. Mixed with aqueous acid chromate of petach and surrivaria and it it turns brown. (Zeller.) - 9. With indide of potassium, it turns brown, the salt at the same time acquiring a yellow colour. (Hübsehmann, N. Er. And. 46, 250.) - 10. With chlorate of potash, and a few drops of oil of vitriol, it burns with a smouldering very smoky flame, and leaves charcoal. (Vogel, Jun., Ann. Pharm, 74, 114) 11. Distilled with 24 pts. water and 8 pts. choride of lime, it gives of carbonic acid with effervescence and yields chloroform. — 12. Distilled with hypothermite of lane, it yields bromeform. (Chautard, Compt. read. 34, 450.) - 13. With an equal quantity of concentrated aqueous solution of bilence act the file that turns lemon-vellow, and yields a light-coloured precipitate. (Schindler, N. Br. Arch. 41, 140.) - 14. Nitropruside copper colours it darker and forms a grey precipitate. Heppe, N. Br. Arch. 89, 57.)

Combinations. 1. With Water. - Hydrated Oil of Bergund. -C"H"O". — The crystals which separate after four or six weeks, when 4 pts, oil of bergamot are set aside with 3 pts, alcohol of sp. gr. 0.84 and 1 pt. of nitric acid, are identical with the turpentine-camphor (p. 265) produced by like treatment of oil of turpentine. (Deville, N. Ann. Chim. Phys. 27, 81; abstr. Ann. Pharm. 71, 348.)

Aqueous Oil of Bergamot. — Oil of bergamot does not take up water, even when boiled with it for a considerable time. (Soubeiran & Capitaine.)

2. With Hydrochloric acid. — Hydrochlorate of Bergamot-oil. — Produced by passing hydrochloric acid gas into bergamot-oil, and distilling the saturated oil with water, and passes over as a colourless, neutral, optically inactive oil, which smells like hydrochlorate of terebene. Sp. gr. 0.896. Boiling point 185°.

	Ohme.	S		
C	78-91		63.00	
Н	10.87		9.19	
Cl	8.34	****	27.81	
0	1.88			
	100.00	1	100.00	

According to Ohme, it is 3C²⁰H¹⁶, HCl + HO; according to Soubeiran & Capitaine, it is isomeric with hydrochlorate of citrene.

The hydrochlorate when heated burns with a green-edged, smoky flame. — When repeatedly distilled over hydrate of potash, or burnt marble, it is converted into an oil having an odour of cajeput and still containing chlorine. Passed in the state of vapour over red-hot lime, it yields naphthalin, benzene, and charcoal. The alcoholic solution, added to aqueous nitrate of silver, throws down chloride of silver. (Ohme.)

Bergamot-oil dissolves in all proportions in absolute alcohol; in ½ pt. alcohol of sp. gr. 0.85 (Zeller), in 2 pts. of sp. gr. 0.951; ond in 28 pts. of sp. gr. 0.966; it takes up 8 p. c. alcohol of sp. gr. 0.966. (Vauquelin.)

2. Carvene.

Völkel. (1843.) Ann. Pharm. 35, 308. — Ann. Pharm. 85, 246;
abstr. J. pr. Chem. 60, 120.
Schweizer. J. pr. Chem. 24, 267; Ann. Pharm. 40, 329; abstr. Repert. 80, 172.

Source. In oil of caraway, together with carvol. (Schweizer.)

Preparation. 1. The portion of oil of caraway, which passes over between 175° and 178°, is separated by repeated fractional distillation. (Völkel.) — Carvene cannot be separated from carvol by mere distillation of oil of caraway, either per se or with potash-ley. (Schweizer.) — 2. Oil of caraway is boiled with pulverised hydrate of potash, as long as it smells of caraway, then distilled with water, till all the oil has passed over, and rectified over hydrate of potash, till the potash is no longer coloured by it. (Schweizer.) — 3. Oil of caraway is boiled with fused glacial phosphoric acid in a flask, the liquid, which distils over, being constantly poured back, until the distillate no longer smells of oil of caraway; and to purify the distillate completely from undecomposed oil of caraway and from carva-

erol produced at the same time, it is rectified over hydrate of potasi, till that substance is no longer coloured by it. Oil of caraway thus treated yields more than a third of its weight of carvene. (Schweizer.) — 4. Oil of caraway is boiled with iodine, and the distillate continually poured back, as long as hydriodic acid continues to escape, and the oil which passes over is rectified, the first portion of the distillate being collected apart. (Schweizer.)

Properties. Transparent, colourless, mobile liquid. (Schweizer.)—Sp. gr. 0.861 at 15°. (Völkel.)—Boiling point 173°.— Vapour-density = 5.175 (by calculation, 4.7144, see page).—It has a faint, but agreeable taste and odour.

					Völkel.		Schweizer.		
				88·23 11·77					
_	C20H1	 136	_	100-00	 99-89	-	98-29	-	98-77

According to Völkel, its formula is CooH14,

Decompositions. 1. Carvene resinises when exposed in small quantities to the air.—2. When set on fire, it burns with a bright-bordered smoky flame.—3. With chlorine, it gives off hydrochloric acid, assumes a transient red-brown colour, and solidifies to impure chlorocarvene—4. Nitric acid converts it, with violent evolution of nitrous acid, into a reddish-yellow, bitter, easily fusible resin, somewhat soluble in hot water, easily soluble in hot alcohol, in ether, in potash, and in acids, insoluble in cold alcohol.—5. By oil of vitriol, it is immediately resinised, with rise of temperature and evolution of sulphurous acid. (Schweizer.)

Combinations. — With Hydrochloric acid. Hydrochlorate of Carrest.

C²⁰H²¹,2HCl. — Anhydrous carvene absorbs dry hydrochloric acid gas, 24 first with rise of temperature, acquiring a transient red colour, and after two days deposits solid crystalline masses. It is saturated completely with hydrochloric acid gas; the crystalline mass which separates is pressed between paper and dissolved in warm alcohol; and the crystals which separate as the solution cools, are again pressed.

Snow-white, shining scales, which melt at 50.5°, solidify again at

41-25°, and have a faint taste and odour.

						3	Schweizer	
	20 C 18 H 2 Cl		120 18 71	-	57·4 8·6 34·0	_	57-72 8-50 33:78	
ī	Cadh	,2HCl	209		100.0		100-00	

It decomposes when heated per se. Heated with nester, it is very quickly resolved into hydrochloric acid, and an all which is probably curvene. Heated with potash, it yields curvene, chloride of calcium, and water. — It dissolves readily in water, with some difficulty in cell alcohol, easily in hot alcohol. (Schweizer.)

barrone dissolves slowly in water, easily in alcohol and other. It does molve chloride of calcium. (Schweizer.)

Appendix to Carvene.

Chlorocarvene C²⁰H¹²Cl⁴(?)

Schweizer. (1841.) J. pr. Chem. 24, 270.

Preparation. Carvene is completely saturated with dry chlorine; the oil, which assumes for a while a red-brown colour, and afterwards changes to a yellow greasy mass, is heated; and the viscid, yellow transparent mass which separates therefrom, is washed with water, then with potash-solution, digested with alcohol, and dried over oil of vitriol or hydrate of potash.

Properties. Yellowish, transparent, semifluid mass, which sinks in water, has a peculiar, but not unpleasant odour, and a sweetish taste.

Decompositions and Combinations. When heated, it gives off hydrochloric acid and a viscid volatile oil, and leaves a carbonaceous residue.

—It burns with difficulty when heated in a glass tube. Exposed to the cir, it quickly becomes moist, white and opaque.

3. Indifferent Oil of Cloves.

Briling. (1834.) Ann. Pharm. 9, 68; Pogg. 31, 526.

Brinns & Marchand. J. pr. Chem. 23, 176.

Brüning. Ann. Pharm. 104, 204; J. pr. Chem. 73, 156.

C. G. Williams. Chem. Gaz. 1858, 170; Ann. Pharm. 107, 242;

N. Ann. Chim. Phys. 54, 433.

Camphene of Oil of Cloves.

Source. In oil of cloves. It is found chiefly in the first portions of liquid which pass over on distilling cloves with water, while the last Portions consist almost wholly of eugenic acid.

Separation from Oil of Cloves. The oil which passes over on distilling oil of cloves, mixed with excess of potash, is again shaken up with aqueous potash, washed, dehydrated with chloride of calcium and rectified. (Brüning.)

Properties. Colourless, strongly refracting oil. (Ettling.) Sp. gr. 6918 at 8° (Ettling); 0.9016 at 14°. (Williams.) Boils at 142°—143° (Ettling); at 251° (Williams); 255° (Brüning). — Smells like oil of turpentine, different from oil of cloves. (Brüning.) It is more viscid than oil of turpentine. (Williams.)

				Ettling.	N	ramann Iarchand	æ l.	Biuning.	W	illliam s.
20 C	120 16	••••	88·24 11·76	 87·17 11·76	•••••	88·16 11·77		87·38 11·90		87·7 11·8
Calle "	136		100.00	 98.93		99.93		33.58	****	93.2

It is not altered by alkalis or by potassium. (Ettling.)
It absorbs hydrochloric acid gas, but does not form with it a crystalline compound. (Ettling.)

It is much less soluble in alcohol than oil of turpentine. (Williams.)

4. Oil of Copaiba.

Bonastre. (1825.) J. Pharm. 11, 529; N. Tr. 12, 1, 180. Ader. J. Pharm. 15, 95; Br. Arch. 30, 311; N. Tr. 20, 1, 184. Gerber. Br. Arch. 30, 157. Blanchet. Ann. Pharm. 7, 156. Soubeiran & Capitaine. J. Pharm. 26, 70; abstr. Ann. Pharm. 34, 321.

Capaira-öl. Eurace de Capalu.

Source and Extraction. — In balsam of copaiba, which exudes from incisions in various species of Copaifera. — 1. The balsam is distilled with water (Soubeiran & Capitaine); per sc. (Blanchet).—2. A solution of 100 pts. balsam of copaiba in 100 pts. alcohol of sp. gr. 0.837 is shaken up with 37.5 pts., soda-ley of sp. gr. 1.33, and 150 pts. water, and the oil which rises to the surface after standing is collected. (Ader.)

Properties. Transparent, colourless, mobile (yellowish-green according to Blanchet). Sp. gr. 0-9 (Schönberg, A. Gehl, 6, 494, Ader); 0-91 (Gerber; Williams, Ann. Pharm. 107, 242); 0-878 at 22° (Blanchet); 0-881-0-885. (Soubeiran & Capitaine.) — Boiling point: 245° (Blanchet, Williams); 245—260°. (Soubeiran & Capitaine.) — Solidifies at -16, partly in the crystalline state. (Gerber.) — Rotatory power, 34-18° left. (Soubeiran & Capitaine.) — Expansion from 0° to 100° = 0-83132; from 100° to 200° = 0-104034. (Aubergier, J. Pharm. 27, 278.)— Has an aromatic odour, like that of the balsam (according to Ader, it has a less agreable odour when prepared by (2) than when obtained by distillation.) Tastes sharp and persistently bitter. (Ader, Gerber.) Neutral (Blanchet); alphy acid. (Gerber.)

Blanchet.

20 C _____ 120 ___ 88-24 ____ 88-74 ___ 88-55
16 H ____ 16 ___ 11-76 ____ 11-66 ___ 11-75

C[©]H²⁶ ____ 136 ___ 100-00 ____ 100-40 ___ 100-30

Decompositions. 1. By continued boiling, the oil becomes brown and viscid. — 2. Chlorine in sunshine makes it hot, colours it yellowish, blue, and then green, and separates white crystalline masses. (Blanchet)—3. Indine, slowly added to it, unites without detonation (Blanchet), with reddish-yellow to brown-black colour; if the iodine be more quickly added, heating and frothing take place (Gerber); the product is a brown mass. (Stoltze, Berl. Jahrb. 27, 2, 200.)—4. It explodes with family mitric acid in the cold (Blanchet), leaving a brown resin (Stoltze) instable in the hot oil. (Gerber.) With nitric acid of sp. gr. 1-32, it was only when heated (Blanchet); according to Bonastre, it assumes

a violet tint at the beginning of the action. Weaker nitric acid forms with the oil a small quantity of yellow resin precipitable by water. (Gerber.) — 5. Oil of vitriol makes it hot and turns it red-brown. (Stoltze.) — With a few drops of oil of vitriol, it becomes hot and blackens; but when dropped into a larger quantity of oil of vitriol, it forms a redbrown solution of sulphoterebic acid. (Gerhardt, Compt. rend. 17, 314.)

— The brown viscid mixture gives off a sulphurous acid when heated.

(Gerber.)

6. With hydrochloric acid gas, it becomes hot and coloured (Blanchet); it becomes brown and viscid, and on cooling, slowly deposits solid bihydrochlorate of copaiba-oil. (Soubeiran & Capitaine.) - 7. It oxidises polassium. (Gerber.) - Potassium immersed in the oil becomes coated in three months with a thick soapy mass. (Gall, Sill. Am. p. 21, 63.) — 8. When shaken up with aqueous potash or soda, it becomes heated, acquires a brown colour, and yields to water a small quantity of resin, which does not pre-exist in the oil, but is produced from it by the action of the alkali. (Gerber.) — 9. Distilled with 24 pts. water and 8 pts. chloride of lime, it gives off carbonic acid and forms chloroform. — 10. Distilled with hypobromite of potash, it forms bromoform. (Chantard, Compt. rend. 34, 485.)

Combinations. With Hydrochloric acid.—a. Bihydrochlorate of copaiba-oil, C20H16,2HCl. Camphre de copahu; salzsaures copahu. (Soubeiran & Capitaine.) Chlorhydrate de copahu. (Gerhardt.)
It is prepared by passing dry hydrochloric acid gas through dehydrated oil of copaiba, separating the crystalline mass which is deposited by the copahu. therefrom on cooling from the brown oil, pressing it between filtering paper, mixing its solution in ether with alcohol of sp. gr. 0.85, and washing the crystalline mass which separates with alcohol. (Blanchet.) -The crystals which separate from the oil when hydrochloric acid is passed through it are recrystallised from alcohol. (Soubeiran &

Hydrochlorate of copaiba-oil forms short, transparent, right rectangular prisms (resembling chlorate of potash, according to Blanchet), which melt at 77°. (Soubeiran & Capitaine.) — They are inodorous (Blanchet; Soubeiran & Capitaine), have a faint camphorous odour, and

an aromatic bitter taste. (Gerber.)

					Blanche		Soubeiran & Capitaine.
20 C	120	****	57.4	*******	57.95	****	57.85
18 H	18		8.6		8.73		8.58
2 Cl	71		34.0		33.04		33.41
C20H16,2HC1	209		100.0		99.72		99.84

The hydrochlorate heated to 140-150° gives off a large quantity of hydrochloric acid gas. (Soubeiran & Capitaine.) When set on fire, it burns with a bright flame. (Gerber.) Nitric acid, heated with it, gives off nitrogen gas [? Gm.]. (Blanchet.) Oil of vitriol with aid of heat dissolves it, and deposits it again in the crystalline form on cooling; at a stronger heat, the solution gives off hydrochloric acid gas. (Blanchet.) Heated with sulphide of lead, it yields an oil having an alliaceous odour. Its alcoholic solution is precipitated by nitrate of silver or mercurous nitrate. (Blanchet.)

It is made in which made in the should sparingly soluble in het amend the should solution on the should solution on the should be should solution on the should be sho and a second of the second of

. Determinent of Impallers. Subsema & Capitaine.) The liquid period is the present something of realing seguidation with hydroclassic last the last the same and seguidate of copilibate of c

Vict in the second role in Societies & Capitaine.)

The contract of second role of the contract of the contrac is i vinn bis binnen it mir medieme et espaita-eil. (Sonbeim a layunne. In time vin a hart 10000 it hydrochloric acid. It give in a prima i in transmission met vien shaken up with vien. benen binne u menne ind state. Gerice.)

The translation of the first of the first of the dark. It dissolves the translation of the first of the first

To the one processors and and by inequale cell; mixes with the name of the combined with the the same are small made and the solution. It mixes with solutions of the same of the transmitter and the little comments, becoming mile

The last use will refer be in the last amount, becoming mile the last use in all transferred it localisates of carbon. (Gerber, last use in a last use in the last use in all properties of the last use in th Larmer

5. Para-copaiba Oil.

Streetlas Capitaine (1941) Present des Ploys (1947)

Francis . In a variety of copaiba balsam from Trans. It is itemed with water, and the oil is dehydrated with chloral of end and Passes.

Property. Transparent collections viscid oil, of sp. gr. 0.91 [058] association to Sinkelein & Carltaine, boiling at 250°. It smells like the brisans are last furning taste. (Posselt.) Rotatory possessions. Sinkelein & Carltaine.)

7 . H 54 C		85-24 19-76		
 C:13	1 5	10(0)	 60.69	

Decompositions. 1. Becomes yellowish when boiled, afterwards brown, thick, tenacious, and charred. (Posselt.) Chlorine converts the oil, with evolution of hydrochloric acid, into a yellow sticky mass. The oil dissolves iodine without detonation.—3. With fuming nitric acid, it detonates even in the cold; but nitric acid of sp. gr. 1.32 resinises it only with aid of heat. Dilute nitric acid, heated with the oil, dissolves it completely after a few days, giving off nitrous acid, carbonic acid, and other volatile acids. From the solution of the oil in nitric acid, water throws down, after evaporation, a reddish-yellow acid resin, sparingly soluble in hot water, easily soluble in alcohol and ether, whilst a peculiar acid remains dissolved, which, when the solution is concentrated by evaporation, crystallises in slender, colourless, transparent, lamines, easily soluble in water, alcohol, ether, and rock-oil, inodorous, having a bitter taste, and a slight acid reaction. (Posselt.)—4. The oil absorbs hydrochloric acid gas with avidity, turning brown-red and fuming in the air, but not depositing any crystals on cooling.

The oil dissolves in all proportions in ether, less easily in absolute

dokol, still less in common alcohol.

6. Oil of Elemi.

Deville. (1839.) Phil. Mag. J. 18, 184; Ann. Pharm. 35, 304.
 Deville. Ann. Chim. Phys. 25, 80; Compt. rend. 12, 184; N. Ann. Chim. Phys. 27, 88; abstr. Ann. Pharm. 71, 352; Pharm. Centralbl. 1849, 691.

Evence d'elemi.

Source and Extraction. In elemi-resin, the resin of Icica Icicariba, Dec., and Icica heptaphylla. (Aublet.) Elemi-resin is distilled with water, and the oil, which passes over readily and floats on water, is separated from the watery distillate, and dehydrated by agitation with chloride of calcium. The process yields 3—5 pts. oil from 100 pts. resin (Stenbouse); good elemi-resin yields 13 p. c. (Deville.)

Properties. Limpid and mobile. Boils at 166° (Stenhouse); at 174° ander 0.755 met. pressure. Sp. gr. 0.852 at 24° (Stenhouse); 0.849 at 11°. (Deville.) Refracting power 1.4719 at 14°. Rotatory power 90.3° to the left. Vapour density 4.84. (Deville.) [Calculation = 47144 (p. 245).] Has a rather pleasant odour, like that of elemi-resin, and a sharp taste. (Deville, Stenhouse.)

			S	tenhous	Deville.		
20 C 16 H							
C ²⁰ H ¹⁶	136	 100.00		99.54		99.95	

Decompositions. Oil of elemi when set on fire burns, with a bright fuliginous flame. — 2. With iodine, it becomes heated, gives off iodine-vapours, and solidifies to a thick red mass. — 3. Nitric acid colours it brownish yellow in the cold, and, when heated, converts it into a resin, vol. xiv.

with explaining and explaining of right excide. — 4. Oil of vitriol gives it a fire red reduce in the rold and leakers it when heated. (Stenhouse.)—

In the crise invitable in a self-gas, and is converted into solid and liquid anythment of the converted. The value. It is not altered by potassium, four i private if grandle with all of heat, converts it into a brown rold. Stenhouse.

Continues on. — We's Epitochloric Acid. A. Solid Bihydrochloric acid gas is passed into the deem of the stream of the being kept up after complete saturation. The real of the off the being kept up after complete saturation. The real of the off the stream of the off hydrochloric acid gas); the expresse of hydrochloric acid gas is the expresse of hydrochloric acid gas; the expresse of hydrochloric acid gas is passed into the stream of hydrochloric acid gas is passed into the stream of hydrochloric acid gas is passed into the stream of the hydrochloric acid gas is passed into the stream of the hydrochloric acid gas is passed into the stream of the hydrochloric acid gas is passed into the stream of the hydrochloric acid gas is passed into the stream of the hydrochloric acid gas is passed into the stream of the hydrochloric acid gas is passed into the stream of the hydrochloric acid gas; the expresse of hyd

			Deville.
24 6	120	57.4	57:37
19 2	1.	5.6	8.70
1 C	7:	34-0	33-93
(751/2EC	264	100-0	100.00

B Light Light with the separation of the solid hydrochloral above hearthest. Devine.

Oil of eleminis insolution in water, sparingly soluble in weak aladdensely in alcoholar subset. Stephensel:

7. Gaultherylene.

CAROTES 1544 N Ave Chief Phys. 10, 358.

Series. In oil of winter-green (Gulltheria precumbers), to the amount of γ_{ij} , mixed with γ_{ij} of methyl-salicylic acid (xii, 255).

Proportion. Winter-green oil is distilled with concentrated aqueous potash: the distillate, consisting of wood-spirit, water, and gaultheries is washed, first with water containing potash, then with pure water and the undissolved oil is dehydrated with chloride of calcium and rectified over potassium.

Properties. Colourless mobile, lighter than water; boils at 167. Vapour-density 4.92 [by calculation, 4.7144 (p. 245)]. Has a raise agreeable peppery odour.

			Cahours.
20 C .	120	84.23	87:83
16 H	16	11:77	12.23
Call.	136	}+4)-1) ()	100-10

8. Oil of Gomart.

DEVILLE. (1849.) N. Ann. Chim. Phys. 27, 90; abstr. Ann. Pharm. 71, 354; Pharm. Centr. 1849, 692; J. pr. Chem. 48, 64.

Bursera-oel.

Source and Extraction. In gomart resin, the thickened resinous juice of Bursera giummifera. (L.) It is obtained by distilling the resin with water. The produce is 4.7 p. c. of coloured oil, which is set aside with solid hydrate of potash, and then rectified over potassium.

Properties. Colourless, transparent oil, smelling like turpentine. Vapour-density = 4.70.

					Deville. mean.
20 C		120	•	88.24	 88.10
16 H		16	• • • •	11.76	 11.85
C20H10	s	136	•••	100-00	 99-95

Combinations. When strongly cooled and saturated with hydrochloric acid gas, it yields silky needles, like those of bihydrochlorate of bmon-oil, and exhibiting a dazzling whiteness, after pressure between biblious paper.

				1	Deville
20 C	120	••••	57.4		57.4
18 H	18	••••	8.6		8.8
2 Cl	71	•…	34.0		33.8

9. Oil of Hops.

PATEN & CHEVALLIER. (1822.) J. Pharm. 8, 214 and 533.

R. WAGNER. J. pr. Chem. 58, 351; Dingl. pol. J. 128, 217; abstr.
Chem. Centrol. 1853, 249.

PRISONNE. Compt. rend. 38, 309; N. J. Pharm. 26, 241 and 329; 27, 22; Instit. 1854, 65; Chem. Centrell. 1854, 228.

Hopfenöl, Essence de houblon.

Source and Extraction. In hops, the female cones of Humulus Lepulus (L.), and in lupulin, the dust contained therein. It is extracted by distilling lupulin (Payen & Chevallier), or fresh hop-cones (Wagner) with water. The product is 2 p. c. of oil (Payen & Chevallier), 0.8 p. c. (Wagner), together with valerianic acid, which remains dissolved in the water. (Personne.)

Properties. Transparent and colourless (Personne); greenish-yellow (rellow from old hops) (Payen & Chevallier); pale greenish-yellow (the distillate between 125° and 225° is colourless, from 225° to 235° yellowish) (Payen & Chevallier). Sp. gr. 0.91 (Payen & Chevallier); 0.908 at 16°.

The state of the s

y A Mines τ_--

154 _ 10900 10000 - The control of the co

Dries up to a sich price up to a

the second conjugated subtant in the second pulsation of the second pulsation This a volatile hydroxide the first with carbonate and viens the first is like resemany, leaving carbonate at a recommendation of the first is like resemany, leaving carbonate of potash, — 8. Dislike the first is a colouriess oil, apparently idented

the second secon A Case of the State of the five water. (Wagner.)

10. Oil of Juniper-berries.

TROMESPORSE 18-12 T select. 1822, 46.

BLANCHET 1 TO THE PROOF 4, 544; Ann. Pharm. 15, 158.

PMAS. 1968 171 C pr. Cir. 4, 544; Ann. Pharm. 15, 158.

PMOFF. N. Br. Arch. 40, 272

Soubeiran & Capitaine. J. Pharm. 26, 78; abstr. Ann. Pharm. 34, 325.

Zeller. Stud. über äther. Oele Landau, 1850. Steer. Wien Akad. Ber. 1856; Chem. Centr. 1856, 60.

Wachholderbeeröl, Wachholderbeeressenz, Essence de genièvre, Oleum baccarum juniperi.

Source and Extraction. In juniper-berries the fleshy scales of the female cones of Juniperus communis (L.). — The ripe but still green berries are bruised and distilled with water (Aschoff), with water and common salt (Blanchet), after previous exhaustion with cold water. (Steer.) The oil thus obtained is rectified with water (Soubeiran & Capitaine), or with quicklime, after washing with salt water and dehydrated by agitation with chloride of calcium. (Blanchet.) — By rectification it yields $\frac{4}{5}$ colourless oil, $\frac{1}{5}$ of oil which passes over coloured, and a small quantity of residual oil. (Soubeiran & Capitaine.)

Unripe juniper-berries yield by distillation a more volatile and a less

Unripe juniper-berries yield by distillation a more volatile and a less volatile oil; the ripe berries only the latter. (Blanchet.) — The yield of oil is only 0.77 p. c. (Tremlich, Repert. 24, 434), 0.65 p. c. Martius, Repert. 39, 24); from the ripe berries of first year's plants, 0.39 p. c.; from green ripe berries, by distillation with water and common salt, 1.56 p. c. (Blanchet); from ripe berries with water, 0.32 p. c.; from fresh berries, 0.46 p. c.; from unripe berries, 0.35 p. c. (v. Hees, Pharm. Centr. 1847, 380); from berries mixed with a small quantity of water, coarsely

bruised and exhausted with cold water, 0.75 p. c. (Steer.)

Properties. Mobile oil. (Blanchet.) Transparent, and colourless to slightly straw-coloured (Blanchet, Martius); greenish to brownish-yellow. (Zeller.) Boiling point of the most volatile oil from the unripe berries, 155°; of the less volatile oil and of that from the ripe berries, 205° (Blanchet); of the first distillate, 155°—163°; of the last, 155°—182°. (Soubeiran & Capitaine.)—Sp. gr. 0.862—0.870 (van Hees, Pharm. Centr. 1847, 380); 0.847—0.881 (Soubeiran & Capitaine); 0.853—0.870 (Zeller); 0.853 (Trommsdorff); of the most volatile oil, 0.839 at 25° (Zeller, Blanchet); 0.855 (Soubeiran & Capitaine); at 100°=0.804 (Anbergier, J. Pharm. 27, 278); of the less volatile oil, 0.8784 at 25° (Blanchet); 0.881 (Soubeiran & Capitaine); of the fresh oil, 0.926; of older oil, 0.912. (Martius.)—Refracting power, 1.475 (Becquerel & Cahours, Compt. rend. 11, 867); 1.474 (Deville, Compt. rend. 11, 867); 1.474 (Deville, Compt. rend. 11, 867); 1.474 (Deville, Compt. rend. 11, 867).—Rotatory power, 3.521° to the left. (Soubeiran & Capitaine,)—Vapour-density = 4.844 (Soubeiran & Capitaine), by calculation, 4.714 (comp. p. 245).—It has a strong odour of juniper, the volatile oil of the unripe berries smells also like fir-needles (Martius, Blanchet); has an aromatic odour and an aromatic resinous taste. (Trommsdorff.) Neutral. (Aschoff, Zeller.)

				Blanchet.				Dumas.
20 C								
C20H16	-	-	-		-		-	

a. The more volatile from the unripe berries. b. Oil from the ripe berries. It is a mixture of the two non-separable oils, which are perhaps formed from the original oil during the distillation. (Soubeiran & Capitaine.)

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formal of inner by princed entact with water at 40, and is grain and its serior with instance of potential time reward of the inner with the bearing the bearing with communication. It exhibits the properties of hydrated oil of turpentine (p. 256).

2 He will after the most of Hydrochlorate of Junipales. (Southerm a Caritaine - Olf of uniper is saturated with dry hydrochlorated gas in the mixture which becomes coloured, but does not solidifferent at -20, is saturated with chalk, then mixed with chlorate design, and allore in through a mixture of animal charcoal and

			Soube	iran & Capitaine.	
30 C	180	 64.99		65.31	
26 H	26	 9.38		9.03	
2 Cl	71	 25.63		25.66	
C50H16,HCl+C10H8,HCl	277	 100.00		100.00	

Oil of juniper forms with $\frac{1}{2}$ pt. absolute alcohol a clear solution, and with 1—10 pts. a turbid solution (Zeller); the more volatile oil of the unipe berries dissolves clearly in 1 pt., with turbidity in a larger quantity of absolute alcohol; the oil of the ripe berries in 8 pts. (Blanchet.) It dissolves sparingly in alcohol of sp. gr. 0.85 (Blanchet); with turbidity in 10 to 12 pts. (Zeller.)

In absolute ether it dissolves in all proportions. (Blanchet.)

Appendix to Oil of Juniper-berries.

Juniper-camphor.

Zaubzer. (1825.) Repert. 22, 415. BUCKNER. Repert. 22, 425.

Obtained from oil of juniper-berries, which had been kept for 6 years an a half-filled loosely stoppered bottle; purified by washing with alcohol.

Colourless, transparent, rhomboidal tables grouped in tufts, heavier than water, melting when heated, and volatilising without decomposition, colidifying in the crystalline form on cooling. Nearly destitute of taste

Burns like a volatile oil. (Zaubzer.) When distilled with phos-

phoric acid, it behaves like turpentine-camphor. (Buchner.)

With 200 pts. of cold water, it forms an incomplete solution, which becomes clear when heated, and remains clear on cooling. It is but alightly soluble in aqueous ammonia. Dissolves in acetic acid more readily than in water. (Buchner.) - From a hot solution in alcohol of sp. gr. 0.830, it separates on cooling in feathery crystals; dissolves more readily in ether. (Zaubzer.)

11. Laurel-oil of Guiana.

HANCOCK. (1824.) Quart. J. of Sc. 75, 47; N. Tr. 11, 171; Br. Arch. 13, 291; J. Pharm. 10, 547. - N. Edinb. J. of Sc. 3, 48; Br. Arch. 86, 333.

Brandes. N. Br. Arch. 21, 169.
Stenhouse. Phil. Mag. J. 20, 273; J. pr. Chem. 27, 251; Mem. Chem. STENHOUSE. Soc. 1, 43; Phil. Mag. J. 25, 200; Ann. Pharm. 50, 155; Mem. Chem. Soc. 2, 121.

Natural Oil of Laurel (Hancock); Ocolea-öl (Löwig, Organ. Verb. 2, 1027.)

Source. In the stem of a tree growing in Spanish Guiana, and belonging to the lauraceous order (Hancock), and to the species Ocotea (Christison), or Pinus. (Stenhouse.)

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Guiana laurel-oil is insoluble in water, soluble in alcohol and ether. A mixture of 1 pt. oil and 2 pts. alcohol floats on ether, although both the oil and the alcohol are heavier than ether. - When the oil is gradually mixed with rectified spirit of wine, the spirit floats for a long time on the oil in spherical drops.

Guiana laurel-oil dissolves camphor, caoutchouc, pitch, resin and

oils, both fat and volatile. (Hancock.)

12. Oil of Lemon.

SAUSSURE. (1822.) Ann. Chim. Phys. 13, 262; Pogg. 25, 370; Ann. Pharm. 3, 157.

Boissenot. J. Pharm. 15, 325; Ann. Chim. Phys. 41, 434; N. Tr. 20, 2, 214.

Dumas. Pogg. 26, 530; Ann. Pharm. 6, 255; Ann. Chim. Phys. 52, 405; Pogg. 29, 129; Ann. Pharm. 9, 61.

BLANCHET & SELL. Ann. Pharm. 6, 280.

LAURENT. Ann. Chim. Phys. 66, 212.

Soubeiran & Capitaine. J. Pharm. 26, 1; N. Br. Arch. 22, 171; abstr. Ann. Pharm. 34, 317.

DEVILLE. Ann. Chim. Phys. 70, 81. — N. Ann. Chim. Phys. 25, 80. — N. Ann. Chim. Phys. 27, 86; Ann. Pharm. 71, 349.
Gerhardt. Compt. rend. 17, 314; N. Ann. Chim. Phys. 14, 113.

BERTHELOT. N. Ann. Chim. Phys. 37, 223; 38, 44; 39, 5; 40, 36; Ann. Pharm. 88, 346.

Zeller. Stud. über äther. Oele. Landau, 1850.

Essence de Citron; Citronen-oel.

Source and Extraction. - In the rind of the lemon (Citrus limonum). The fresh rind is torn to pieces and pressed; the oil which runs out is filtered (Saussure); or the expressed oil is distilled; or the fresh rind is distilled with water. (Berthelot.)

Properties. Transparent and colourless, or yellowish (Saussure); pale Yellow or greenish yellow to dark yellow (Zeller); after rectification with water, it is colourless at first, but afterwards turns yellowish (Blanchet & Sell); mobile. (Saussure.) — Sp. gr. 0.8517 at 22° (Saussure); 0.8514 at 18° (Guibourt); 0.856 at 25° (Chardin); 0.790 at 100° (Aubergier, J. Pharm. 27, 278); 0.852 at 14.6 (Brix, Pogg. 55, 381); 0.838 at 0° (Frankenheim, Pogg. 72, 422); 0.84—0.86. (Zeller.) — Rectified: 0.847 at 22° (Saussure); 0.856 at 18° (Chardin); 0.848 (Soubeiran & Capitale); distilled at 18.55° in recent of 0.8514 at 142° distilled at about 80° in recent at 55° in vacuo: 0.8514 at 14°; distilled at about 80° in vacuo, 0.8506 at 65° (Berthelot); distilled with water: first distillate, 0.877; last, 0.853. (Soubeiran & Capitaine.)

Boiling point 160°-170° (Soubeiran & Capitaine); 146° (Aubergier); 176-1°. (Brix.) Distilled with water: first distillate, 167°; last, 173°. (Blanchet & Sell.) Expansion from 0° to 100° = 0.09821; from 0° to 135° = 0.138068. (Frankenheim, Pogg. 72, 422.) — Vapour-density = 4.73 (Soubeiran & Capitaine), by calculation 4.71 (comp. p. 245). — Specific heat (water = 1) = 0.45. Latent heat of vapour (vapour of water at 100° = 432) = 63.85. (Brix.) - Refracting power (water = 1.333) = 1475 (Becquerel & A. Cahours, Compt. rend. 11, 867; Pogg. 51, 427); 3-----

चाँच व व व व स्थाला 14:48. Devine. Compt. rend. 11, 865; I also Academ power, So 484 to the right (Biot, Ana. The man is the man is a captaine; in the sill rectified with water; first limit is the sill at the sill rectified at 55 in varm, a captaine is distilled at 55 in varm, a capt

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To note that in natures artimodilities said, oil of lemon must be regarded as The control of the co

the later appearance is another a small quantity of an oxygenated oil. (Gerhark,

Lemma-il absorbs crypen gas, gradually assuming when the variety of the variety of the acid, nitrogen, and hydrogen and hydrogen are acid, nitrogen, and hydrogen a variety of the variety of vicinity vicinities as a daily average, 1.07; after four weeks at 12. The training the following thirty months, some of the contract with insulated expenses. Size-it: Iz contact with insolated oxygen in the size it very long contact with the size it is it. J. p. Chem. 60, 254), it acquires a

parameter of the area terminated for in contact with water; the rectifed the laws of the area terminated of the Arch. 40, 273); it forms access so i and the result in Asimira. J. Dr. Arch. 40, 273); it forms accurate in an interest in a second and different odour, and yields by district as it with an interest resin remains behind. (Boissenst) — 2. The district interest is for several hours without alteration, in a stable of its as the district interest interest when it is heated to 360°; after being the resident of the hours of the continuous and the resident to the resident to the resident to

Sold from hear 636 to the right. The permanence of the rotatory power of oil of lem n when it is heated to 300, distinguishes it from oil of tarpentine; Lenes the presence of oil of turpentine in oil of lemon may be detected by the alteration of the rotatory power by a temperature of 800 . (Berthelot.) Lemon-oil, passed in the state of vapour through - heated porcelain tube, yields a non-inflammable gas, tar, and charcoal sure.) - 3 Cotton, saturated with oil of lemon, chars on the surface y chlorine gas, but does not take fire. (Bottger, J. pr. Chem. 18.

72 7 . after hear not 6 9 for an hour, it rotates 73° to the right; 10

498.) In contact with 20 vols. water, it decolorises bromine gradually added to it, and forms hydrobromic acid. The rectified oil absorbs 227 8, the crude oil, 242 8-253 3 p. c. bromine. (Williams, Chem. Gaz. 263, 365; J. pr. Chem. 61, 18.) — 5. With iodine, it becomes heated, and gives off hydriodic acid, together with violet and yellow vapours. (Guyot, J. Phys. 5, 230; Walcker, Pogg. 6, 126); becomes reddish, yellow-green, and viscid. (Zeller.) — 6. With funing nitric acid, it froths strongly, and forms a brownish-yellow resin (Hasse, Crell. Ann. 1785, 1, 422); with ordinary nitric acid, it assumes a slight brownish colour, and gives off gas when heated (Zeller); with alcoholic nitric acid, it forms hydrated oil of lemon. (Deville.) With oil of vitriol, it turns yellowish brown (Zeller), and is converted, like oil of turpentine, into terebene and colophene (pp. 257, 279) (Deville); dropt into a large quantity of oil of vitriol, it forms a red-brown solution of sulphoterebic acid. (Gerhardt, Compt. rend. 17, 314.) - 8. When distilled with anhydrous phosphoric acid, it yields terebene and colophene. (Deville.) With hydrochloric acid gas, it turns brown, (Thénard, Mem. de la Soc. d'Arcueil, 2, 32), yellow if heated, expanding by 16.6, p. c. and increasing in weight by 11 p. c. (Saussure), and solidifies to crystalline hydrochlorate of lemon-oil (Thénard), completely (Dumas), partially (Blanchet & Sell; Soubeiran & Capitaine.) Lemon-oil, distilled in vacuo at 55°, solidifies partially when saturated with hydrochloric acid gas; that which distils at 80°, solidifies completely. (Berthelot.) — 10. Lemon-oil remains unaltered when heated to 100° for three hours with anhydrous boracic acid. — 11. Heated to 100° for 30 hours with crystallised tartaric or citric acid, it remains unaltered, but when treated in like manner with oxalic acid, it decreases in rotatory power, and loses the property of crystallising with hydrochloric acid.—12. With potassium, it gives off a small quantity of hydrogen in the cold, more when heated.—The oil, which is thereby coloured brown, ceases to be decomposed after repeated distillation over poussium, and acquires a very agreeable odour.—13. When left in contact with hydrate of potash, it deposits brown flocks, which settle upon the solid potash. The oil thus treated does not turn brown, but acquires a stronger and more agreeable odour. (Gerhardt.)—14. Distilled with 8 pts. chloride of lime and 24 pts. water, it yields chloroform. (Chautard, flompt. rend, 34, 485; J. pr. Chem. 56, 238.) Distilled with hypotromite of lime and water, it yields bromoform. (Chautard, Compt. rend. 34, 485; J. pr. Chem. 56, 238.) — 16. The rotatory power of lements oil is diminished by twenty hours heating to 100° with chloride of zinc. (Berthelot.) — 17. With a strong solution of bibasic acetate of lead, it forms a slight yellow precipitate. (Schindler, N. Br. Arch. 41, 140.)

-19. It is not altered by nitroprusside of copper. (Heppe, N. Br. Arch. 89, 57.)

Combinations. 1. With Water. Hydrated Oil of Lemon; Hydrate of Lemon-oil. — Isomeric and identical with turpentine-camphor. — It is produced by mixing 4 pts. of commercial oil of lemon, 3 pts. of alcohol of sp. gr. 0.85, and 1 pt. of commercial nitric acid, leaving the mixture to stand for 4 weeks, then collecting the resulting crystals and purifying them in the manner as those of turpentine-camphor. (Deville.)

2. With Hydrochloric Acid. a. Monohydrochlorate of Lemon-oil. (Deville.) C²⁰H¹⁶,HCl. Appears to be frequently present in small quantity in the portion of lemon-oil which remains liquid after saturation with hydrochloric acid gas (liquid lemon-camphor; Soubeiran & Capitaine).

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			Dumas.	Blanchet & Sell.	Deville.
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H#,HCl .	209	. 100-0	100:00	99-92	100.0

positions. 1. When heated, it gives off hydrochloric acid [35] ; Blanchet & Sell ; Soubeiran & Capitaine ; Derille); volatile oil (Saussure); an oil which solidifies again at 20° (Blanchet & Sell), and distils partially without decomposition. (Saussure.) When quickly heated above 100°, it distils for the most part undecomposed, the distillate being merely covered with a trace of oil; when it is moderately heated to 50—60°, part of it sublimes in large laminæ, whilst the rest distils over as a limpid oil, containing hydrochloric acid and still holding crystals in solution. (Saussure.)—2. When set on fire, it burns less easily than artificial camphor. (Saussure.)—3. By distillation with water, it yields a watery liquid having an acid reaction. (Blanchet & Sell.)—4. Chlorine gas acts upon fused bihydrochlorate of lemon-oil, partially converting it after a while, with evolution of hydrochloric acid, into chlorinated bihydrochlorate of lemon-oil. If this compound be gently heated to remove free chlorine and hydrochloric acid, an oil is obtained, consisting of 9 At. hydrochlorate of chlorocitrenase and 1 At. hydrochlorate of citrene = 9(C20H14Cl2,2HCl) + C20H16,2HCl. (Laurent.)—5. With fuming nitric acid, the compound froths up slightly, and dissolves in it after 14 days (Saussure); ordinary nitric acid does not attack it in the cold, but decomposes it completely when heated, giving off nitrous acid. (Blanchet & Sell.)—6. Oil of vitriol poured upon the compound, eliminates hydrochloric acid gas. (Saussure.)—7. Gently heated with potassium, it yields colourless oil of lemon, and by continued boiling with it at a higher temperature, it yields citrene. (Deville.)—8. When treated with potash, it gives off part of its hydrochloric acid, and is converted into an oil from which no further quantity of acid can be extracted by potash. (Blanchet & Sell.)—9. Heated with lime or baryta, it yields citrene. (Saussure and others.)—10. It is decomposed by nitrate of silver and mercuric nitrate, even in the cold; but not by nitrate of lead, even with the aid of heat. (Blanchet & Sell.)

Combinations. Bihydrochlorate of lemon-oil is insoluble in water, soluble at 14° in 5.88 pts of alcohol of sp. gr. 0.806 (Saussure), soluble in ether (Blanchet & Sell), in oil of lemon. (Saussure.) The alcoholic solution deposits slender laminæ when mixed with water, and yields regular crystals by spontaneous evaporation (Saussure); it likewise decomposes partially when evaporating. (Soubeiran & Capitaine.)

c. Liquid Lemon-camphor. Hydrochlorate of Citrylene. (Soubeiran & Capitaine.) Hydrochlorate of Citryl. (Blanchet & Sell.) The compound which remains liquid after the saturation of lemon-oil with hydrochloric acid gas. The liquid is cooled to — 10°, to separate the solid bihydrochlorate which remains dissolved, and filtered through chalk and animal charcoal to remove colouring matter and free hydrochloric acid. (Soubeiran & Capitaine.) Volatile oil (Blanchet & Sell); without rotatory power. (Soubeiran & Capitaine.) It gives up hydrochloric acid when its alcoholic solution is precipitated by water, or when it is filtered through chalk and charcoal. (Soubeiran & Capitaine.) By saturation with dry hydrochloric acid gas, it is completely converted into a white crystalline mass, which, when dissolved in hot alcohol, does not yield any crystals on cooling, but a heavy oil and a specifically lighter acid, which remains dissolved in the alcohol, a few crystals of bihydrochlorate of lemon-oil likewise floating in the liquid. (Blanchet & Sell.)

Oil of lemon dissolves phosphorus, and then resinises quickly on exposure to the air. With a small quantity of phosphorus, it forms an oil smelling

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Described to the Whon thrown on red-hot coals, it volatilises without the post- and is but partially decomposed in a red-hot crucible.

2. Heated with cross or the force of this gives off nitrous acid without forming examinate in cold nitric acid it dissolves without decomposition.

3. With the force of the forms a red solution having a peculiar aromatic.

om which water separates a resin insoluble in water and hydrod, and not melting at 100. Boissenot.)

CITRENE. 303

Combinations. Lemon-camphor is insoluble in cold, but dissolves, abundantly in boiling water. - The solution solidifies in a crystalline mass

on cooling (Boissenot); it is iridescent. (Berthelot.)

It does not absorb hydrochloric acid gas, but dissolves in hydrochloric acid. — The solution becomes turbid when heated above 100°, but clear again on cooling. (Boissenot.) - It dissolves in acetic acid, alcohol, and ether, is insoluble in pure oil of lemon, but soluble in the old oil containing neetic acid. (Boissenot.) The alcoholic solution partially solidifies on cooling in the crystalline form (Blanchet & Sell), gelatinous (Berthelot).

13. Citrene.

SAUSSURE. (1820.) Ann. Chim. Phys. 13, 265. BLANCHET & SELL. Ann. Pharm. 6, 286.

DUMAS. Ann. Chim. Phys. 52, 405; Pogg. 29, 129; Ann. Pharm. 9, 61.

Soubeiran & Capitaine. J. Pharm. 26, 1; N. Br. Arch. 22, 171; abstr. Ann. Pharm. 34, 318.

DEVILLE. N. Ann. Chim. Phys. 27, 86.

Citrène (Dumas, Soubeiran & Capitaine); Citronyl (Blanchet & Sell.) First prepared in 1820 by Saussure (p. 301.)

Preparation. 1. Bihydrochlorate of citron-oil is distilled three times over lime, and the oil which passes over each time is redistilled six times over baryta. (Dumas.) — Saussure distilled it over 5 pts. of lime between 50° and 60°. — 2. Bihydrochlorate of lemon-oil is first distilled by itself to remove part of the hydrochloric acid, then passed in the state of vapour over lime heated to 180° (Soubeiran & Capitaine), and the yellow oil which passes over is rectified over recently ignited lime, and finally over potassium. (Blanchet & Sell.) — Fused bihydrochlorate of lemon-oil is distilled over potassium, and the oil which passes over is collected. (Deville.)

Properties. Transparent and colourless. (Blanchet & Sell; Dumas.) Sp. gr. 0.8569 (Blanchet & Sell); 0.847. (Soubeiran & Capitaine.) — Boiling point 165°. (Blanchet & Sell; Soubeiran & Capitaine.) — Vapour-density 4.891 (Cahours, Ann. Chim. Phys. 70, 101); 473 (Soubeiran & Capitaine); by calculation = 4.71 (p. 245). — Optically inactive. (Soubeiran & Capitaine.) — Smells like oil of lemon (Dumas); less agreeably (Soubeiran & Capitaine); aromatic, like hydrochlorate of citron-oil. (Blanchet & Sell.

					Blanchet & Sell.	t	Dumas.	Deville.
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C20H16	136	****	100 00	· · · · · · · · · · · · · · · · · · ·	100.09	****	100.09	 99:86

With hydrochloric acid gas it becomes coloured, without producing crystals (Saussure), forming a liquid and a solid hydrochlorate. (Soubeiran & Capitaine.)

14. Citrilene.

Sicurian & Capitains. 1847. J. Pinna. 26, 1; N. Br. Arch, 22, 1711 alors And Fhorm. 24, 217.

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1750, and having a relative tree in a Various-density = 5.08. Optically inerire - Societar o Copuline

15. Oil of Lime.

Drmas. 1888. Junit. N. 97: J. pr. Chem. 4, 434. VOHL N. E. Ami. 74, 16; absz. Chem. Centr. 1853, 318.

Louisia. Hair de limette.

Surre and Experient. In the rind of the lime (Citrus limetta). - The nois are tern and pressed or distilled with water.

Properties. Like oil of lemon.

			Dumas.		
∌ €	120	85-24	87-6		
15 H	16	11.26	11.4		
CHB1	135	160-00	100-0		

With a mixture of the mate of petast and oil of vitriol, it becomes strongly heated, and forms limetro add, C"H*O". (Vohl.)

16. Oil of Mandarin.

LUCA. (1857.) Compt. rend. 45, 904; J. pr. Chem. 75, 187; N. J. Phirm. 33, 51; Lucit. 1857, 383.

Mandarinoi. Essence de Mandarin.

Source and Extraction. In peculiar cells of the rind of Citrus bigaradia sincusis and mysticidia. The rinds are pressed, after their surface has been lacerated, and the oil which runs out is filtered.

Properties. Pale yellowish: after rectification, colourless, clear, and mobile. Sp. gr. 0.852 at 10: 0.8517 at 12. Boiling point 178. Has an agreeable odour, different from the oils of lemon and orange, and ot unpleasant taste, like that of orange oil. Rotatory power 85-5' to ight.

CaoH1e	136		100.00		99.54	_
16 H	16	••••	11.77	••••	11.96	
20 C	120	••••	88.23	••••	87.58	
					Luca.	

Decompositions. 1. With cold nitric acid, it assumes a faint yellow colour, and is decomposed by hot nitric acid, with evolution of nitrous acid, the mixture, on addition of water, depositing a nearly solid mass. -2. With cold oil of vitriol, it turns red, but is decolorised again when mixed with water; hot oil of vitriol chars it, and gives off sulphurous acid. - 3. With hydrochloric acid, it turns brown forming solid bihydrochlorate of mandarin-oil.

Combinations. 1. With Water. Mandarin oil, left in contact with alcoholic nitric acid, forms a crystalline mass, which is probably hydrated mandarin-oil.

2. With Hydrochloric Acid. — Bihydrochlorate of Mandarin-oil. The oil is saturated with dry hydrochloric acid gas, or shaken up with strong hydrochloric acid, and the crystalline mass which separates from the brown liquid after a few days, is collected, pressed between filtering paper and dried.

Small, solid, transparent laminæ, which melt when heated, volatilise without decomposition, have a peculiar odour, and are insoluble in water

but soluble in alcohol and ether.

Mandarin-oil is insoluble in water, to which, however, it imparts its odour.

It dissolves in 10 pts. of alcohol, also in ether and in glacial acetic

acid, and in every proportion of bisulphide of carbon.

It dissolves iodine, bromine, phosphorus, sulphur, oils, both fixed and volatile, wax, and resins. (Luca.)

17. Oil of Orange-peel.

GAUBIUS. Adversaria. 30. Soubeiran & Capitaine. J. Pharm. 26, 65. ZRLLER. Stud. über. äther Oele. Landau, 1850.

Besence d'orange, Orangenschalenöl, Pomeranzenschalenöl.

Source and Extraction. In orange-peel, the rind of Citrus Aurantium (L.). — The lacerated rind is pressed or distilled with water, or the expressed oil is distilled with water.

Properties. Pale yellow to greenish yellow, mobile. (Lewis, Zeller.) Sp. gr. 0.888 (Lewis), 0.835 — 0.837 (Soubeiran & Capitaine); 0.83 — 0.85; of older oil, 0.88 (Zeller). Boiling point 180°. Vapour-density 4.69. (Soubeiran & Capitaine.) Calculation = 4.714 (p. 245). Solidines partially when cooled. (Bizio, Bruyn. Giorn. 19, 360.) Rotatory power 125.59' — 127.43' right. It has an agreeable odour. Neutral. (Zeller.) VOL. XIV.

				 ebeiran & quitaine.
			28-23	
16 H	 16		11-77	 11-65
CaH.	 136	_	100-00	 100-00

Decompositions. 1. When kept in closed vessels, it deposits crystalina, easily fusible, volatile clots, soluble in water and alcohol, and ultimately turns viscid and brown. (Gaubius.) With iodine, it gives off yellowing red vapours with great violence, turning reddish yellow-brown, and assuming a resinous consistence.—3. With nitric acid, it turns greatily yellow, gives off gas when heated, and is converted into a brittle min.

—4. Oil of vitriol colours it dark reddish yellow-brown.—5. Mind with an equal quantity of bibasic acetate of load, it yields an emagnyellow precipitate, turning red in an hour, and becoming lighter after a week. (Schindler, N. Br. Arch. 41, 140.)

Combinations. With Hydrochloric Acid.—1. Monohydrochlorate of Orango-peel-oil. The portion which remains liquid when the oil it antarated with hydrochloric acid gas. (Soubeiran & Capitains.)—2. Bihydrochlorate of orango-peel oil CohlaCOo. Salid Hydrochlorate of Orango-peel-comptor, Hydrochlorate of Hesperideus. The portion which solidifies when the oil is saturated with hydrochloric acid gas. In crystalline form and odour it resembles bihydrochlorate of lemon-oil, Molts at 50°. Has no rotatory power. (Soubeiran & Capitaine.)

			Soubeiran & Capitaine.		
29 C 1	20	 57-5		57-95	
18 H	18	 8-6		8-61	
2 Cl	71	 33 -9		33-44	
C*H*,2HCl 2	:09	 100-0		100-00	

It decomposes as easily as bihydrochlorate of lemon-oil. (Soubeiran & Capitains)

Oil of orange-peel dissolves in absolute alcohol, and with turbidity is 7—10 pts of alcohol of sp. gr. 0.85. (Zeller.)

18. Oil of China Orange.

VOLKEL. (1840.) Ann. Pharm. 39, 120; Repert. 80 164.

Apfelsinenöl.

Source and Extraction. In the rind of Cetrus aurantium sinensis. It is obtained by pressing the fresh lacerated rind or distilling it with water.

19. Oil of Parsley.

Löwig & Weidmann. (1841.) Pogg. 46, 53; abstr. Repert. 70, 163. ZELLER. Stud. über. äther. Oele; Landau, 1850.

Petersilienol, Essence de persil, Oleum petroselini.

Source and Extraction. In parsley-seeds, the fruit of Apium petroselinum. - The bruised seeds are distilled with water, and the more volatile oil which first passes over is collected. At the same time there passes over a less volatile oil, which solidifies to parsley-camphor. (Lowig & Wiedmann, inf.) The watery distillate must be kept for some time in the cold, in order to obtain the oil which then only separates from it. (Schutz, Repert. 15, 275.)

Properties. Greenish yellow oil; after rectification, colourless, transparent, and mobile. The crude oil boils above 210°, the rectified oil between 160° and 170°. (Löwig & Wiedmann.) It solidifies between 2° and 8°. Sp. gr. 1 015 — 1 144. (Zeller.) Smells like parsley. (Löwig & Wiedmann.) Neutral. (Zeller.)

					Löwig & Veidmann.
20 C	120	100	88:24		88.04
16 H	16	9111	11.76		11.88
C20H16	136		100.00	********	99.92

Decompositions. 1. The crude oil thickens by boiling, finally becoming resinous, and when distilled per se or with water, is resolved into liquid oil which passes over and camphor which remains behind. (Löwig & Weidmann.)—2. *Iodine* dissolves slowly in the heated oil, and colours it brown-red. (Flaschoff, Br. Arch. 33, 225.) It detonates with iodine, giving off yellow and violet vapours, and is converted into a dark red-brown resin. (Winkler, Repert. 32, 271.) — 3. Nitric acid colours it yellow or brown, and resinise it (Zeller); forms malic and oxalic acids. (Scheele, Opusc. 2, 206.) Oil of vitriol colours it violet to dark red, without thickening it (Zeller); the solution mixed with water deposits resin. (Bley.) It absorbs hydrochloric acid gas, with rise of temperature, and turns brown. (Löwig & Weidmann.)
Oil of parsley dissolves in 2.5 pts. alcohol of sp. gr. 0.85. (Zeller.)

20. Oil of Pepper.

LUCAE. Taschenbuch, 1822, 81. DUMAS. J. Chim. méd. 11, 308; Instit. 97; J. pr. Chem. 4, 435.
SOUBEIRAN & CAPITAINE. J. Pharm. 26, 75; abstr. Ann. Pharm. 34, 326.

Pfefferol, Essence de poivre, Oleum piperis.

Source and Extraction. In black pepper, the unripe berries, and in white pepper, the seed of Piper nigrum, (L.) Bruised black pepper is distilled with water; and the oil which passes over is rectified with salt-water, and dehydrated by agitation with chloride of calcium. (Soebeiran & Capitaine.) Black pepper yields 1.17, white pepper, 1.04 p. c. of oil. (Lecann.)

Properties. Limpid and mobile. Sp. gr. 0.993 (Lucae); 0.864. Boiling point 167.5°, ultimately rising to 170°. Vapour-density = 4.74. Calculated 4.714 (p. 245). (Soubeiran & Capitaine.) Has a strong smell of pepper and a mild taste. (Lucae.)

				1	Dames.	
20 C	120		88.23		87.9	
16 H	16	••••	11.77		11.7	
 C30H16	136	••••	100.00		99.6	

Decompositions. 1. By a few drops of oil of vitriol, it is heated and blackened; but when dropt into a large quantity of oil of vitriel, it forms a red brown solution of sulphoterebic acid. (Gerhardt, Compt. rend. 17, 314.) — 2. When saturated with dry hydrochloric acid gas, it turns brown, and forms hydrochlorate of pepper-oil. (Soubeiran & Capitaine.) — 3 When set aside or heated with potassium, it acquires an odour recalling that of pepper and of lemons. (Gerhardt, Compt. rend. 17, 315; N. Ann. Chim. Phys. 14, 114.)

Combinations. With Hydrochloric Acid. Hydrochlorate of Pepper cil.— The oil is completely saturated with dry hydrochloric acid gas, as filtered through charcoal, which is completely covered with a layer of chalk. Colourless liquid, containing 62.69 p. c. C, 8.80 H, and 28.51 C, and therefore approximating in composition to the formula C¹⁰H¹⁰,2HCl. (Soubeiran & Capitaine.)

21. Pepper-oil from Long Pepper.

Dulong. J. Pharm. 11, 59; N. Tr. 11, 1, 104.

In long pepper, the monospermic-berry-carrying flower-stalks of Chavica Roxburghii and Ch. officinarum. (Dulong) They are brained and distilled with water. — Limpid, lighter than water, with an uppleasant odour and sharp taste.

22. Oil of Peucedanum Oreoselinum.

Schnedermann & Winckler. Ann. Pharm. 51, 336.

Source and Extraction. By distilling the fresh herb of Poucedense Orecoelinum with water.

Properties. Has a strong aromatic odour like that of juniper. Sp. 0.840, and boiling point 163°.

Schnedermann & Winckler. a. 88.36 87.50 20 C..... 120 11-77 11.79 16 H 16 11.84 C30H16 136 100 00 100·20 99·29

a the first portion of the distillate; b the last.

Combinations With Hydrochloric Acid. The first portion of the distillate above-mentioned absorbs hydrochloric acid gas abundantly, and is thereby converted into a compound analogous to monohydrochlorate of turpentine-oil (p. 265). The oil cooled to 0° is saturated with hydro-chloric acid gas; the resin which separates is removed, and the oil is shaken up with soda-solution, distilled with water, and dried over chloride of calcium.

Colourless liquid, gradually turning brown. Lighter than water; boils at about 190°; smells like turpentine.

				100.000	Winckler.
20 C 17 H	17:0	****	69·6 9·9 20·5		69.54 9.71 20.86
C20H16, HC1	172.5	-	100.0	orien.	100-11

23. Hydrocarbon from Cil of Chamomile.

Gerhardt. (1848.) Compt. rend. 26, 225; N. J. Pharm. 14, 52; N. Ann. Chim. Phys. 24, 96; J. pr. Chem. 45, 321; Ann. Pharm. 67, 235.

Oil of chamonile obtained by distilling the flowers of Anthemis mobilis, is a mixture of a non-oxygenated oil with angelic aldehyde and a small quantity of angelic acid (x, 413). When it is heated in a retort with pulverised hydrate of potash, and the oil which passes over is rectified over potassium, angelate of potash remains behind (easily resolved by excess of potash at a higher temperature into acetate and propionate of potash (Chiozza, N. Ann. Chim. Phys. 39, 435; J. pr. Chem. 61, 231; Ann. Pharm. 86, 261), and an oil is obtained, having an agreeable odour of lemons, boiling at 175°, and containing 87.8 p. c. C and 11.8 H, therefore isomeric with oil of turpentine. This oil does not form with oil of vitriol a compound analogous to sulphocymenic acid (p. 188), but it unites with chloride of calcium, forming crystals which are decomposed by water. The same oil is obtained by distilling oil of chamomile with alcoholic potash, mixing the alcoholic distillate with water, and syphoning off the oil which separates. (Gerhardt.)

Crude oil of chamomile is blue (Dehne, Crell. chem. J. 3, 25; Zeller), greenish, and distils to $\frac{3}{3}$ between 180° and 190°, the remaining $\frac{1}{3}$ passing over between 190° and 210°; the latter portion contains 76.06 p. c. C, 10.67 H, and 13.27 O. (Gerhardt.) The fresh flowers yield 0.31 p.c. oil (Hagen), 0.047 (Lecanu); the dry flowers, 0.08 p.c. (Lecanu), 0.61 p.c. (Hagen); and the water which passes over contains in solution, acetic, butyric, valerianic, and perhaps propionic acid. (Wunder, J. pr. Chem. 64, 499; Hautz, J. pr. Chem. 62, 317.)

24. Oil of Savin.

Dumas. (1835.) J. Chim. méd. 11, 307; Ann. Pharm. 15, 158; J. pr. Chem. 4, 435.

LAURENT. Rev. Scient. 10, 127.

Zeller. Stud. über äther. Oele; Landau, 1850.

Sadebaumöl, Sevenbaumöl, Sabinaöl; Essence de Sabine; Oleum Sabine.

Source and Extraction. In the leaves, young branches, and twigs of Juniperus sabina (L.). They are cut to pieces while fresh, and distilled with water.

Properties. Pale to dark reddish yellow (Zeller); limpid after rectification. (Dumas.) Sp. gr. 0.89 — 0.94 (Zeller.) Boils at 155 — 161°. (Dumas.) Smells and tastes like the leaves and branches of the plant. Neutral. (Zeller.)

			Dumas
20 C 16 H			
C30H16	136	 100.00	 100-3

Decompositions. 1. When it is mixed with $\frac{1}{3}$ vol. water, and bromine is gradually added to it, the oil becomes heated, destroys the colour of the bromine, till 185 pts. of bromine have been added to 100 pts. of the crude oil, or 211.3 pts. bromine to 100 pts. of the rectified oil, and is converted into a colourless aromatic oil. (Williams, Chem. Gaz. 263, 365; J. pr. Chem. 61, 20.) — 2. With iodine, it becomes very strongly heated, detonates, gives off yellow and violet-red vapours, and forms a red-brown resinous mass, having the consistence of honey (Flaschoff, Br. Arch. 33, 225; Winckler, Repert. 32, 271; Zeller), and an empyreumatic odour. (Winckler.) Iodine dissolves, with rise of temperature, in an equal quantity of oil of savin, forming a red-brown solution which, when distilled to dryness, gives off a large quantity of hydrodis acid. and yields a distillate consisting of a brown oil, and finally of abalsam, which sinks to the bottom, while charcoal remains behind (Guyot, J. Phys. 5, 230.) — 3. With nitric acid, it gives off gas with violence, becomes hot, and assumes a reddish-yellow to brownish-yellow colour. — 4. With oil of vitriol, it turns yellowish red (Hesse, Zeller); mixed with an equal quantity of oil of vitriol, and distilled with hydrate of potash, it yields 4 p. c. of an oil smelling like thyme. (Wincklet, Repert. 92, 320) — 5. With bichromate of potash and oil of vitriol assumes a pale brownish colour. (Zeller.) — 6. Distilled with 44 per of water and 8 pts. of chloride of lime, it gives off carbonic acid with effervescence, and yields chloroform. — 7. By distillation with Apperomite of lime, it yields bromoform. (Chautard, Compt. rend. 34, 485)

Combinations. Oil of savin dissolves in all proportions of about alcohol; clearly in 2 pts. alcohol of sp. gr. 0.85; with opalescence in 3 pts. or more. (Zeller.)

25. Thymene.

DOVERI. N. Ann. Chim. Phys. 20, 174.

LALLEMANDE. (1853.) Compt. rend. 37, 433; J. pr. Chem. 60, 433;
N. Ann. Chim. Phys. 49, 155; abstr. Ann. Pharm. 101, 119; 102, 119.

STENHOUSE. Ann. Pharm. 98, 308.

First observed by Doveri; obtained pure by Lallemand.

Source and Extraction. In volatile oil of thyme. It forms, together with cymene, the more volatile part of that oil. (Lallemand.)

Preparation. The portion of oil of thyme which passes over on fractional distillation between 166° and 185°, is repeatedly rectified over caustic potash, then per se, whereupon thymene passes over from 160° to 165°, and cymene at 175°. The process does not, however, afford a complete separation of the cymene, which has hitherto not been attained. (Lallemand.)

Properties. Colourless oil, having an agreeable odour of thyme, boiling at 160° — 165°, and of sp. gr. 0.868 at 20°. It deflects polarised light to the left, but less strongly after repeated rectification over caustic potash. (Lallemand.)

It dissolves in oil of vitriol, with rise of temperature, and yields by

distillation the same products as oil of turpentine.

It absorbs hydrochloric acid gas, with slight rise of temperature, and forms a compound which remains liquid at - 20°, and, after purification with chalk and animal charcoal, contains 20 p. c. chlorine. (Lallemand.)

Doveri obtained by the fractional distillation of oil of thyme, a product boiling between 178° and 180°, which contained on the average 85 8 p. c. carbon, 10.9 hydrogen, and 3'3 oxygen, but had a vapour-density = 8'314, whence he regarded it as a mixture of a hydrocarbon with thymol. This substance was scarcely attacked by anhydrous phosphoric acid, merely becoming slightly heated, and after two distillations therewith, still contained 86 p. c. C, 11'4 H, and 3'6 O. It absorbed hydrochloric acid gas with avidity, becoming coloured and heated, and yielding, after the excess of hydrochloric acid had been driven out by a stream of dry carbonic acid, a thin redbrown liquid, which had an agreeable odour of camphor, solidified while immersed in a freezing mixture, and in which crystals made their appearance after the lapse of a month.

From the volatile oil of the seeds of Ptychotis Ajowan, Stenhouse obtained by fractional distillation, dehydration with chloride of calcium of the portion which passed over below 176°, distillation over caustic potash, treatment with sodium, and rectifica-tion, a colourless strongly refracting oil, having a pungent, aromatic odour, different from that of oil of thyme, of sp. gr. 0.854 at 12°, and boiling at 172°. It formed with hydrochloric acid gas, a brown, thin liquid. It contains 88:24 p. c. C, and 11.5 H, and is therefore C²⁰H¹⁶ (and perhaps identical with Lallemand's thymene, Kr.) According to Haines, it is C²⁰H¹⁴, therefore cymene (Ann. Pharm. 98, 315). See page 184.

26. Tolene.

DEVILLE. (1841.) N. Ann. Chim. Phys. 3, 154; J. pr. Chem. 25, 323.
 E. Kopp. Compt. chim. 1849, 145; abstr. Compt. rend. 24, 614;
 N. J. Pharm. 11, 425.

Source. In balsam of tolu.

Preparation. 4 pts. of tolu-balsam are distilled with 3 pts. of water, and the distillate is repeatedly cohobated. The oil which passes over is a mixture of benzoic acid, cinnamein (xiii, 283), and tolene, which passes over when the crude oil is heated for some time to 160°, and may be obtained pure by frequent rectification over hydrate of potash (contains a sufficient quantity of water to keep it in the liquid state) and collecting the portion which first goes over (the latter portion which distrils at 180° contains 84.90 p. c. carbon, 11.83 hydrogen, and 3.27 oxygen. (Deville.)

Properties. Colourless mobile oil, boiling from 154° to 160° (Kopp) at 170° (Deville), and of sp. gr. 0.858. (Kopp.) It has a sharp, pungeot, peppery taste, and smells like elemi-resin, different from tolu-balsam (Kopp.) Vapour-density somewhat below 5.71 (Deville) (by calculation 4.714; see page 245.)

					Deville.		Kopp. mean.	
20 C 16 H					88·60 11·33	-	88·40 11·45	
C20H16	136	100	100.00	previous.	99.93	1000	99.85	

According to Deville, it is C24H18 (calculation 88.9 p. c. C, 11.11 H), which agrees better with the analysis, but not with the boiling point.

In vessels containing air, it becomes continually thicker, without colouring, and is finally converted into a soft oxidised resin, containing 75.2 p. c. carbon. (Kopp.)

27. Valerene or Borneene.

GERHARDT & CAHOURS. (1841.) N. Ann. Chim. Phys. 1, 62. PRLOUZE Compt. rend. 11, 365; abstr. J. Pharm. 26, 645; J. pr. Chem. 22, 379; Ann. Pharm. 40, 326.

GERHARDT. N. Ann. Chim, Phys. 7, 275; Ann. Pharm. 45, 29; abett.

Compt. rend. 14, 832; J. pr. Chem. 27, 124.

JEANJEAN. Compt. rend. 42, 857; Instit. 1856, 176; J. pr. Chem. 69, 204; Ann. Pharm. 101, 94; Chem. Centralbl. 1856, 575.

PIERLOT. N. Ann. Chim. Phys. 56, 291.

The non-oxygenated constituent of volatile oil of valerian, Gerhardie Borneene, and Pierlot's Valerene, is, according to Gerhardt, identical with the hydrocarbon of the camphor-oil examined by Pelouze, and with the hyrocarbon which that chemist obtained from borneol by the action of anhydrous phosphoric acid; according to Jeanjean, it is identical with the hydrocarbon of madder fusel-oil. The identity of these bodies being doubtful, we shall in the following distinguish as valerene the hydrocarbon from oil of valerian, as borneene that from oil of camphor, and as madder-borneene that from madder fusel-oil. (Kr.)

A. Valerene from Oil of Valerian. — Oil of valerian obtained by distillation with water, the root of Valeriana off. is a mixture of valerianic acid, valerol (xi, 396), valerene (borneene, according to Gerhardt), and borneol, gradually formed therefrom by the action of the air. If the portion which passes over first in the fractional distillation be rectified over fused hydrate of potash, whereby the valerol is converted into valerate of potash, a mixture of borneol and valerene is obtained, from which the borneol may be entirely removed by repeated fractional distillation, the product which passes over first being each time collected apart. (Gerhardt.) — Oil of valerian is a mixture of 5 pts. valerianic acid, 25 pts. valerene and 70 pts. valerol, which last (different from Gerhardt's valerol) contains $\frac{5}{70}$ water, $\frac{47}{70}$ resin, and $\frac{18}{70}$ valerian-camphor, or is resolved into these constituents by distillation. Valerian-oil when distilled gives off between 120° and 200° an acid yellow oil which, when rectified over fused hydrate of potash, yields valerene below 200°, while valerate of potash and Pierlot's valerol remain in the residue. (Pierlot.)

Properties of Valerene. Colourless oil, boiling at 160° under a pressure of 0.76 met. Vapour-density 4.60 (by calculation = 4.7144, p. 245). Lighter than water. Smells like oil of turpentine, but more agreeably. (Gerhardt, Pierlot.)

			9	Gerhardt.	
20 C 16 H		88·23 11·77		88·08 11·86	
C20H16	136	 100.00	min	99-94	

Decompositions. 1. It is not converted into camphor by dry oxygen.—2. In contact with excess of bromine, it gives off hydrobromic acid, and becomes yellow and viscid.—3. It absorbs hydrochloric acid gas and becomes crystalline.—4. Nitric acid does not act upon it in the cold, but attacks it violently when heated. If the valerene is free from borneol, no common camphor is produced, though Gerhardt formerly obtained this substance by the action of nitric acid from valerene containing borneol, and supposed that it was produced from the borneol.—5. It is not altered by melting hydrate of potash, but when set aside for some time with potash-ley and then distilled, it is converted, wholly or partially, into borneol, especially in presence of alcohol. (Gerhardt.)

B. Borneene from the Camphor-oil of Dryabalanops Camphora. — The younger stems of the camphor-tree (Dryabalanops Camphora), which grows in Borneo and Sumatra, contain oil of camphor, which exudes from incisions made in them, whereas the older stems are destitute of oil, but contain borneol in their cavities (Pelouze; comp. also Martius, Ann. Pharm. 27, 63; Blanchet & Sell, Ann. Pharm. 6, 302). In the natural state, it contains a resin in solution, from which it may be freed by distillation. (Pelouze.)

Oil, of lower specific gravity than water, boiling at 165°, having an

odour of turpentine-oil, and isomeric therewith. Rotatory power 398" to the left. (Compt. rend. 11, 371.) It absorbs oxygen gas with availity, and is thereby converted into C20H16O4, without forming carbonic acid. (Pelouze.) Pelouze does not state that he obtained common camphor in this manner, though Gerhardt (N. Ann. Chim. Phys. 7, 282), attributes this statement to him. Kr.) — It absorbs as much hydrochloric acid as oil of turpentine. (Pelonze, Compt. rend. 11, 367; abstr. Ann. Pharm. 40, 326.)

Camphor-oil from Laurus camphora. Martius (4nn. Pharm. 27, 63) examined camphor-oil imported from China, which, according to his later statements (N. Repert. 1, 541), was obtained from Laurus camphora. As this tree yields common camphor, but not borneol, the camphor-oil obtained from it was probably different from that of the Dryabalanops camphora examined by Pelouze, which is associated with borneol, and it is doubtful whether the camphor dissolved in the camphor-oil which Martin examined was common camphor, or borneol (as supposed by Gerhardt, N. Ann. Chin. Phys. 7, 284), since, in 1838, the distinctive characters of the two kinds of campbur were not known with certainty. Commercial, dark wine-yellow campbor-oil, of sp. gr. 0.945, is a mixture which deposits a large quantity of campbor by cooling a spontaneous evaporation. When subjected to fractional distillation, it leaves, after that passed over, a residue which contains a larger quantity of campbor and solidines a cooling, while the distillate, on being redistilled till to has passed over, yields rectified campbor-oil free from campbor. This oil is transparent, colouries, constitutionally refracted, mobile, smalls like accombor and except oil and has a density of about 1931. mobile, smells like camphor and cajeput-oil, and has a density of about 0.91. contains 82.03 p. c. C, 11.35 H, and 6.62 O, and according to Martius is California.

Rectified camphor-oil evaporated in a watch-glass leaves resin but no camphor. It does not appear to take up oxygen, but absorbs dry hydrochloric acid gas, with rise of temperature, forming a wax-yellow liquid, which fumes from excess of hydrochloric acid, and when cooled to —8°, solidifies to a soft butter, without depositing crystals. When dry chlorine gas is passed through the rectified oil, it assumes a transient rubired colour, gives off hydrochloric acid, and forms, after washing with water, as all colours and the state of the

similar to that produced by hydrochloric seid.

Rectified camphor-oil (probably that of Martius, Kr.) is C²⁰H¹⁶O, and is converted into camphor by nitric acid. (Macfarlane, Ann. Pharm. 31, 72.)

In light yellow camphor-oil of unknown origin, which yielded no camphor when distilled alone, and only traces when distilled with water, Mulder (J. pr. Chrs. 17. 106; Ann. Pharm. 31, 71) found, after drying over chloride of calcium, 80-41 p.c. C, 10.84 H, and 8.75 O, and accordingly regarded it as a mixture of common campber and a non-oxygenated oil, C20H16.

C. Madder Borneene from Madder Fusel-oil. - The fusel-oil contained in the alcohol produced by the fermentation of madder-sugar yield liquid products when distilled at temperatures rising to 230°, while at higher temperatures lavo-rotatory borneol sublimes. From the former, by digestion with caustic potash, then with chloride of calcium, and repeated fractional distillation, a liquid may be separated which boils at 160°, contains 88°23 p. c. C, and 11°81 H, has a vapour-density of 485, and is probably therefore borneene C²⁰H¹⁶. (Jeanjean.) — Leverotatory borneol from madder fusel-oil yields by distillation with anlydrous phosphoric acid, a hydrocarbon smelling like oil of bergamot and oil of lemon (Jeanjean), which, according to Gerhardt's statements (p. 313), should be identical with madder borneene.

Appendix to Valerene.

1. Crude Oil of Valerian. Constituents (pp. 312, 313.) According to the (older) statements of Kraus, it is an oxide of oil of turpentine CoHO according to Ettling (Ann. Pharm. 9, 40) it is a mixture of oxygented

and non-oxygenated oil. — According to Hurault (N. J. Pharm. 12, 96), the oil does not exist in the root ready-formed, inasmuch as ether does not extract any of it, but is produced from the root by the action of water. The same view is maintained by Bouchardat, but Pierlot considers it erroneous.

Properties of the crude oil. — Mobile oil, of pale yellow, or greenish to yellowish brown colour. (Trommsdorff, N. Tr. 18, 1, 3.) The root of the plant growing in woods yields a green oil, that which grows in marshes a yellow oil. (Pierlot.) Roots a year old yield 1.82 p. c. of oil (Bley, Repert. 48, 84). Sp. gr. 0.90 to 0.96 (Zeller); 0.936 at 10° . (Pierlot.) It does not solidify at -40° , but at -15° it deposits white flocks of valerianic acid. (Pierlot.) Its odour is fresh and agreeable, strong and pungent, like camphor, It is neutral, either in the fresh or in the rectified state (Gerhardt); acid (Zeller, Pierlot, and others). It is resolved into its constituents by distillation, as described at page 313.

Oil of valerian resinises when exposed to the air, acquiring an unpleasant odour, and forming valerianic acid, in consequence of its containing valerol. (Gerhardt.) After the ready-formed valerianic acid in the valerian-oil has been removed, it is not possible by any means to obtain an additional quantity of that acid from the oil.— When oil of valerian is exposed to the air, the greater part of the non-oxygenated oil, of the valerianic acid, and of the water escapes, and the oxygenated oil becomes resinised. (Pierlot.)—It dissolves iodine with evolution of heat, giving off a small quantity of greyish yellow vapours, and acquiring a dark redbrown colour. (Zeller.)—With \(\frac{1}{6} \) pt. of nitric acid at 24°, it turns violet (Bonastre, J. Pharm. 12, 66); blue, afterwards yellow, acquires a viscid consistence (Rochleder), and forms oxalic acid. (Bonastre.) According to Rochleder, it does not form oxalic acid, but on distilling the mixture, it gives off nitrous acid, and forms common camphor precipitable by water, a volatile substance which attacks the eyes strongly, a less volatile body which reddens potash-ley, and a fixed yellow resin.—When oil of valerian is heated with nitric acid, a blue resin is formed, heavier than water, insoluble in alcohol and in potash-ley, and similar to that which exists in the root ready-formed. (Pierlot.)

With oil of vitriol, it turns dark brown-red to violet; with bichromate of potash and oil of vitriol, greenish. (Zeller, Studien uber äther. Oele, Landau, 1850.) Oil of valerian treated with potash-ley, yields a resin and a neutral oil which forms common camphor with nitric acid. (Rochleder, Ann. Pharm. 44, 1.) It does not form any compound with caustic

potash or soda. (Pierlot.)

Oil of valerian dissolves in an equal quantity of alcohol of sp. gr. 0.85, and in every proportion of absolute alcohol. (Zeller.)

28. Xanthoxylene.

STENHOUSE. (1858.) Pharm. J. Trans. 17, 19; Ann. Pharm. 104, 236; J. pr. Chem. 73, 179; Chem. Centralbl. 1858, 237.

Source and Extraction. In the seed of Spanish pepper (Xanthoxylum piperitum, Dec.). — The bruised seeds are distilled with water; the oil,

mixed with solid xanthoxylin, is collected and cooled, the separated xanthoxylin is removed by filtration, and the oil is dehydrated with chloride of calcium and rectified over potash, then over potassium.

Properties. Colourless, strongly refracting. Boils at 162°. Has an agreeably aromatic and persistent odour.

				8	tenhouse.
			88·23 11·77		88·08 11·60
C20H	16	136	 100.00	********	99-68

Xanthoxylene forms a liquid compound with hydrochloric acid. (Stenhouse.)

Appendix to Oils Isomeric with Oil of Turpentine.

(Oil of Wormseed and its Products of Decomposition.)

Oil of Wormseed.

TROMMSDORFF. (1819.) N. Tr. 3, 1, 312. VÖLCKEL. Ann. Pharm. 38, 110; abstr. Repert. 80, 176. — Ann. Pharm. 87, 312; abstr. J. pr. Chem. 61, 515. - Ann. Pharm. 89, 358.

ZELLER. Stud. über äther. Oele, Landau, 1850.

azkı. Zeitschr. f. Pharm. 1854, 3; 17; 65; 80. — Ibid. 1855, 2; 33; 49; 65; 81; 98; 114; 130; 144; 161; 179. HIRZEL.

Wurmsamenoel, Oil or Essence of Semen contra, Oleum cinæ.

Source and Extraction. In Levant and Barbary wormseed, the unexpanded flower-buds of Artemisia Vahliana Kosteletzky, Artemisia contra Vahl, and Artemisia Siberi. — It is obtained by distilling the braised wormseed with water. - The water which passes over with the oil contains acetic acid. (Wunder, J. pr. Chem. 64, 499.)

Properties. Transparent and colourless to pale yellow (Trommsdarf and others); pale yellow to brownish yellow. (Zeller.) The crode of is brownish yellow; that which is obtained by distilling the seeds with is brownish yellow; that which is obtained by distilling the seeds with milk of lime, and boils between 160° and 170°, is transparent and colourless (Hirzel); after distillation over hydrate of potash, it boils at 180°, and is transparent and colourless. (Völkel.)—Mobile (the crude of slightly viscid). (Hirzel.)—Sp. gr. 0.9258 at 11° (Wackenroder, Karalarch, 11, 78; N. Tr. 14, 2, 3); 0.936 (Völkel); 0.92—0.93 (Zeller); 0.946 at 11°. (Hirzel.)—The oil rectified over hydrate of potash, and boiling between 175° and 180°, has a sp. gr. of 0.919 at 20° (Völkel); that which is obtained from the seeds by distillation with milk of lime has a sp. gr. of 0.945 at 8°. (Hirzel.)—Boiling point of the crude oil, 170°—220° (Völkel); 175°—180° (Hirzel.); of the rectified oil, 175°. (Hirzel.) The oil treated with alcoholic potash and then distilled with water, boils at 175° (Völkel); that which is obtained from the seed by water, boils at 175° (Völkel); that which is obtained from the seed by

distillation with milk of lime, begins to boil at 160°, boils chiefly between 175° and 177°; after rectification, between 174° and 175. (Hirzel.)-It smells like the seeds (Hirzel); more like camphor than the seeds (Trommsdorff); wormseed oil from Baltimore smells more like chenopodium. (Buchner, Repert, 12, 438.) Its taste is sharp and somewhat bitter (Trommsdorff); burning and aromatic. (Wackenroder.) It reddens litmus (Zeller); is neutral. (Hirzel.)

			Völckel.			Hirzel.		
		a.	6.	c.	d.	e.		
24 C144	80.00	78.44	77.89	79.83	78-92	78-49		
20 H 20	11.11	10.65	10.58	11.31	11.43	11.40		
2 0 16	8.89	10.91	11.53	8.86	. 9.65	10.11		
C24H20O2180	100.00	100.00	100.00	100.00	. 100.00	100.00		

a the first; b the last distillate corresponding to the formula C¹⁸H¹⁵O² (Völkel); the first distillate corresponds to the formula C¹⁰H⁷O, according to which 3 At. oil = C²⁰H²¹O³, by giving up 3 At. H and taking up 3 At. O, forms santonin C²⁰H¹⁸O⁶ (Heldt, Ann. Pharm. 63, 55); c, the oil rectified over hydrate of potash, corresponds to the formula C²⁴H²⁰O²; d. oil obtained from the seeds by distillation with water; e. with milk of lime; the former corresponds to the formula C²⁰H¹⁸O², the latter to the formula C²⁰H¹⁸O². (Hirzel.)

Wormseed oil is mixed with another, a small quantity of propionic acid, and

it is a mixture of cinæbene, cinæbene-camphor, a small quantity of propionic acid, and oxide of propyl, the differences in its properties being due to the varying proportions of

their constituents. (Hirzel.)

Decompositions. 1. When set on fire, it burns with a clear luminous flame. (Völkel, Hirzel.) - 2. It dissolves iodine quickly, without evolation of vapour or rise of temperature, forming a yellowish red-brown, viscid mass (Zeller); it dissolves \(\frac{1}{6} \) to \(\frac{1}{4} \) of iodine, with rise of temperature, and is converted into a dark brown-red, viscid, opaque, stinking liquid, which, on cooling, deposits black crystalline laminæ, apparently consisting of iodine and cinæbene. (Hirzel.) Water shaken up with the solution of iodine in wormseed-oil extracts from it acetic, propionic, and hydriodic acids, together with a substance smelling like opium, probably iodide of propyl. The solution of iodine in wormseed-oil gives off when distilled, aqueous propionic acid, hydriodic acid, iodoform, and especially a mobile, dark brown, peculiar-smelling oil, consisting chiefly of cinæbenecamphor, cinæbene and cymene, together with hydriodic acid both dissolved and chemically combined, also hydriodate of cinæbene, and small quantities of augelic acid and cinacrol, whilst there remains a solid, blue-black, easily inflammable body which burns, though very slowly, with a clear, luminous flame, and consists of cinæphene, cinæphone, and cinæphane. - 3. With nitric acid, it acquires a reddish yellow colour (Zeller), and when heated therewith gives off gas with violence, and is converted into a yellow resinous mass insoluble in water (Zeller, Völkel); with dilute nitric acid, it forms oxalic acid (Völkel); heated in small quantities with nitric acid, it forms toluylic acid, a small quantity of oxalic acid being formed only when strong nitric acid is used. (Hirzel.) -4. With oil of vitriol, it acquires a red-brown colour (Zeller), becomes hot and viseid, and after some time gives off sulphurous acid. (Völkel.)

— 5. It absorbs hydrochloric acid gas, and when saturated therewith forms a dark red oil, which on cooling deposits crystals of wormseed-oil camphor. (Völkel, Hirzel.) - 6. Heated with anhydrous phosphoric acid, it forms a black mass, which on boiling yields as, liquid products, aqueous propionic acid, cinæbene, cinæphene and cinacrol (Hirzel); it becomes partially resinised, viscid, and is converted into cynene. (Völkel.)—7. Distilled with hydrate of potash, it yields a mobile, limpid oil baving an agreeable odour (like oil of peppermint, according to Völkel), and a warm burning taste; easily inflammable, burning with a clear flame, having a sp. gr. of 0.93, consisting of an equal number of atoms of cinabene, cinabene-camphor and a compound containing C¹0H³O, with ¼ At propione, and boiling at 175°—176°.5. Hydrochloric acid gas colours this oil red, and forms with it, shining very deliquescent needles. Oil of vitriol renders it viscid and dark brown, and when heated with it, gives off sulphurous acid; nitric acid converts it into liquid volatile products and fixed resinous products; distilled with anhydrous phosphoric acid, it gives off propionic acid, an oil consisting of 4 At. cymene, 2 At. cinabene, and 1 At. cinabene-camphor, together with smaller quantities of cinabene and cinacrol. (Hirzel.)

Combinations. With Hydrochloric Acid. Wormseed-oil camphor.—
Obtained by passing dry hydrochloric acid gas into wormseed-oil, cooling the saturated red oil, and pressing the separating crystalline mass between filtering paper.—Colourless slender needles. Odour aromatic, like that of camphor; taste mild and warming. When exposed to the air, it deliquesces and takes up water (Volkel); without taking up water (Hirzel). When heated, it melts into a nearly colourless oil, which gives off hydrochloric acid by distillation. Deliquesces quickly when covered with water. (Volkel, Hirzel.)

Wormseed-oil dissolves in 1000 pts. of water, readily in alcohol and ether (Trommsdorff), in every proportion of absolute alcohol, and in an

equal quantity of alcohol of sp. gr. 0.85. (Zeller.)

Cinæphane. C20H8.

HIRZEL. (1855.) Zeitschr. J. Pharm. 1855, 163, 182.

Formation. By distilling wormseed-oil with iodine (p. 317).

Preparation. The thick brown liquid produced by dissolving iodise in wormseed-oil is distilled, and the resulting brown oil is heated to above 360°, whereby a distillate is obtained, consisting chiefly decinable cinable camphor, cinable e, cinaphone remains behind. The residual well boiled with alcohol, gives up cinaphene to that solvent, and after the adhering alcohol has been evaporated, is itself soluble in chloroform. On mixing this solution with 20 pts. of alcohol of sp. gr. 0.84, it deposits a resin, which, after washing with hot alcohol and water, is a mixture of cinaphane and cinaphone. The latter is dissolved out by ether, and the residual cinaphane is purified by solution in chloroform, preparation with alcohol, and washing with ether. The cinaphone is prespitated from the ethereal solution by alochol.

Properties. Very soft, loose, nearly velvet-black powder, without taste or smell.

00.0	100	09.75		Hirzel.
8 H				
C%H8	128	100.00	*******	99-69

Decompositions and Combinations. Cinephene, when heated, burns away with a glimmering light, without melting or leaving any residue. It dissolves in chloroform, but not in ether. (Hirzel.)

Cinæphone. C20H12.

HIRZEL. (1855.) Zeitschr. J. Pharm. 1855, 163, 182.

Formation. By distilling wormseed-oil with iodine (p. 317).

Properties. Soft, loose, light, kermes-brown powder, which adheres strongly to glass, to paper, and to the fingers; tasteless and inodorous. It has not been obtained quite free from iodine.

Decompositions and Combinations. When heated, it melts to a black mass, gives off empyreumatic vapours, and leaves a light charcoal which burns away easily and completely. When set on fire, it burns with a yellow non-fuliginous flame, leaving a large quantity of pure charcoal. It dissolves readily in chloroform, ether, and wormseed-oil, but is insoluble in water, alcohol, and aqueous alkalis. (Hirzel.)

Cinæbene. C20H16.

Hirzel. (1854.) Zeitschr. f. Pharm. 1854, 7, 67. — 1855, 52; 68, 82; 147; 182.

Source. In wormseed-oil, together with cinæbene-camphor, and small quantities of propionic acid and oxide of propyl.

Formation. By distilling wormseed-oil with anhydrous phosphoric acid, whereby the cinæbene-camphor is dehydrated.

Preparation. By distilling wormseed-oil with anhydrous phosphoric acid in a retort, so long as, together with aqueous products, a light oil passes over with brisk but ultimately quiet ebullition, and till only a small quantity of oil remains mixed with the phosphoric acid; shaking up the oily distillate with water and carbonate of baryta; and rectifying it over anhydrous phosphoric acid after dehydration with chloride of calcium.

Properties. Transparent, colourless, slightly iridescent, refracting, mobile. Sp. gr. 0.878 at 16°. Boiling point 172°. Odour slightly aromatic, more like that of oil of amber when heated. Cinebene from wormseed-oil, prepared by distilling wormseed with milk of lime, smells like oil of lemon. Taste slightly warming, afterwards burning.

00.0	100	00.00	Hirzel.
		88.23	
C20H16	136	100.00	99.98

Isomeric with terebene. Probably identical with Völkel's cynene. (Schwanert.)

Decompositions 1. Cinæbene, when set on fire, burns with a clear flame — 2. Heated with an equal volume of nitric acid of sp. gr. 1-16, it gives off, with violent intumescence and evolution of nitrous acid, first, water containing propionic or acetic acid, and floating thereon, a thin colourless oil which has a fruity odour, leaves when evaporated, flocks smelling like camphor, is very volatile, is easily set on fire, and burns with a clear flame,—and, ultimately, hydrocyanic acid with a small quantity of bitter almond-oil, while a viscid resin remains. This resin has a peculiar odour like anise and fennel, and yields, by renewed boiling with nitric acid of sp. gr. 1.16, a solution which, on cooling, deposite toluylic and nitrotoluylic acids, also an undissolved viscid oil which appears to be anisylous acid. No oxalic acid is formed. A small quantity of cinæbene added to strong nitric acid colours it dark red; the mixture froths up strongly when heated, and contains a small quantity of oxalic acid. Cinæbene, heated with oil of vitriol, acquires a red-brown colour. — 3. Dry hydrochloric acid gas colours it wine-red without separating crystals; on dissolving the cinæbene thus coloured in alcoholic potash, and adding water, a colourless oil separates, having a strong and agreeable odour of camphor, and decomposing when heated.

Combinations. 1. With Water. Cinæbene-camphor, Hydrated Cinabene, C20H18O2. Occurs in worm-seed-oil, together with propionic acid and oxide of propyl, but cannot be separated in the pure state. (Hirzel.)

 With Hydriodic Acid. Hydriodate of Cinæbene, 2C™H™,HL− Obtained by rectifying the oil which passes over when wormseed-oil is distilled with iodine; collecting apart the last portion of the distillate, extracting the cinacrol from it by repeated agitation with aqueous potash; washing the residual oil with water, then distilling it with water, and collecting separately the last portion of the oily distillate, which must then be washed with water and dehydrated with chloride of calcium.

Limpid to pale yellow, tolerably viscid; has an agreeable camphorometeristent odour. Neutral.

40 C	33	****	8.22	******	8.64
2C20H16,HI	400		100.00		99.83

It becomes reddish by exposure to the air, and is decomposed by tillation, even with water. (Hirzel.)

Cinæbene is insoluble in water, but dissolves readily in alcohol and ether. (Hirzel.)

Cynene. C24H18,

Völkel. Ann. Pharm. 89, 358.

Formation and Preparation. Wormseed-oil is repeatedly distinct with anhydrous phosphoric acid; the oil, which resinises and become viscid, is mixed with oil of vitriol; and the layer of liquid which floats on the acid is removed, distilled with water after washing, and again per se, after dehydration with chloride of calcium.

Properties. Limpid and mobile. Sp. gr. 0.825 at 16°. Boils at 173° - 175°. Odour peculiar, like that of wormseed; taste faint, after-

wards burning.

24 C 18 H						
C24H18	162	,	100.00	*******	99-98	_

Formed from wormseed-oil, C²⁴H²⁰O², by separation of 2 At. water. (Völkel.) Probably identical with Hirzel's cinæbene. (Schwanert.)

Decompositions and Combinations. 1. Burns with a bright fuliginous flame when set on fire.—2. With cold strong nitric acid, it becomes yellowish-brown; boiled with strong nitric acid, it forms, with violent action, a solution which deposits a heavy yellow oil when mixed with water; by warm dilute nitric acid it is not altered. It dissolves in fuming oil of vitriol, forming a conjugated acid. It is insoluble in water, easily soluble in alcohol and ether. (Völkel.)

Cinæphene. C20H16 or C40H32.

HIRZEL. Zeitsch. f. Pharm. 1854, 17, 182. - 1855, 162, 182.

Formation. By distilling wormseed-oil with anhydrous phosphoric acid or with iodine.

Preparation. 1. The oil which passes over on heating wormseed-oil with anhydrous phosphoric acid, is freed from admixed aqueous products, and the portion which goes over between 35° and 325°, when it is rectified per se, is collected and dried over chloride of calcium.—2. The brown oil obtained by distilling wormseed-oil with iodine is rectified; the light brown viscid residue is extracted with strong aqueous potash, washed with water, and heated to 360° as long as oil continues to distil over; and this oil is freed from admixed cinacrol by agitation with warm dilute aqueous potash, then with water, afterwards dried with chloride of calcium, and rectified.

Properties. Transparent and colourless by transmitted light, but exhibits an indigo-blue iridescence by reflected light; viscid; lighter than water. Boils at 315°—325°. Nearly destitute of taste and smell.

	20 C 16 H			Hirzel. 88.03 11.63	
-	C20H16	136	 100.00	 99.66	Ī

Probably isomeric with colophene. (Hirzel.)

Decompositions and Combinations. 1. When heated, it becomes mobile and gives off vapours smelling like amber; burns with a very smoky flame when set on fire.—2. When heated with strong sulphuric vol. XIV.

acid, it is converted into a yellow resin, which has a peculiar musk-like odour, and when distilled with aqueous potash, yields, with frothing, a distillate smelling of ammonia.

Cinephene is insoluble in water, sparingly soluble in cold alcohol,

easily in hot alcohol, ether, and volatile oils.

Cinacrol. C26H18O4.

Zeitschr. f. Pharm. 1855, 84; 98, 130.

Formation. From wormseed-oil: a. by heating with iodine; b. by distillation with anhydrous phosphoric acid; c. by heating with hydric

of potash.

Preparation. Wormseed-oil is distilled with 1-1 iodine; the mobile dark brown iodated oil which passes over is separated from the aquous distillate, and rectified per se; the nearly black heavy oil which passes over towards the end of the distillation is collected and shaken up with strong aqueous potash; the potash-ley, which thereby acquires a dark brown-yellow colour, is heated till it becomes inodorous, then distillwith a slight excess of dilute sulphuric acid; and the oil which pass over is rectified over chalk, and dehydrated by agitation with chloride of

Properties. Colourless to pale yellow; viscid. Sp. gr. 1.05-115. Boiling point about 250°. — Has a faint, not unpleasant, smoky odor, a sharp, caustic taste, and produces white, painfully burning space on the tongue. Mixed with hydrochloric acid, it does not colour fishavings. Permanent in the air.

40	*********	32	****	15.23	10000	15.43
					*******	9.12
	namana				*******	75.45
						Hirzel

It becomes mobile when heated, and burns quickly with a smally

flame when set on fire.

It dissolves sparingly in water, readily and in any quantity in aques alkalis and their carbonates, in aqueous alkaline earths, and in amount - The aqueous solution forms with neutral acetate of lead, after addition of ammonia, a flocculent white precipitate (cinaerol with oxide of lead) with basic acetate of lead, an immediate precipitate, soluble in excess the basic acetate. It colours sesquichloride of iron bluish green, affecting a delicate reaction, but not in presence of alcohol. From nitrate of old it throws down pale yellow flocks, reducing the silver when heated. Cinacrol dissolves in alcohol, ether, and acetic acid. (Hirzel.)

C. Volatile Empyreumatic Oils.

1. Oil of Amber.

Anthon. (1835.) Repert. 54, 76.

ELSNER. J. pr. Chem. 26, 101; Pharm. Centr. 1842, 454.

PELLETIER & Walter. N. Ann. Chim. Phys. 9, 99; J. pr. Chem. 31, 114; Pharm. Centr. 1843, 910.

Döpping. Ann. Pharm. 54, 239; N. Br. Arch. 43, 147.

Marsson. N. Br. Arch. 62, 1; abstr. Pharm. Centralbi. 1850, 413.

Zeller. Stud. über. äther. Oele. Landau, 1850.

Huile de succin pyrogenée, Bernsteinel, Bernsteineupion,

Formation. The empyreumatic oil which passes over in the dry distillation of amber, either consists entirely of hydrocarbons having the composition of oil of turpentine, or contains such hydrocarbons mixed with other substances. — It is converted into rectified oil of amber by separation of the simultaneously formed succinic acid, and repeated rectification per se (Martius, Repert, 12,426), or with water (Pharm. Boruss. Ed. vi), whereupon, however, only a small quantity of the oil passes over (Marsson), or over pounded glass mixed with a small quantity of paste of chloride of lime. (Schütz. Repert, 15, 274). — Amber yields 25 to 31 p. c. of the crude oil. (Bley & Diesel, N. Br. Arch. 55, 171.)

Preparation of the Hydrocarbon from Oil of Amber. — 1. In the dry distillation of amber, two different oils are obtained, the first of which passes over below a red heat, the second at a dull red heat. In rectification, the first distils between 110° and 260°, the second between 140° and 300°, and at the end of the process, a solid substance like ozocerite remains; but even repeated rectification does not yield products of constant boiling point. The two oils are scarcely or not at all affected by hydrate of potash; but oil of vitriol attacks them violently, imparting a dark colour. If the two oils are repeatedly shaken up with strong sulphuric acid, decanted, distilled per se, again shaken up with sulphuric acid, and so on, they both yield the same colourless mobile oil, which is no longer coloured by strong sulphuric acid, and boils between 130° and 400°. This oil, after rectification over potassium and anhydrous phosphoric acid, or over anhydrous phosphoric acid alone, has the composition given below, and that which distils between 130° and 175°, has a vapour-density = 4·3; hence Pelletier and Walter assign to it the formula CisH¹¹ (cale, vapour-density 4·23). (Pelletier and Walter.)

2. When oil of amber is shaken up with potash-ley, it yields to this

2. When oil of amber is shaken up with potash-ley, it yields to this liquid a brown-red substance, and nothing afterwards to oil of vitriol. The oil treated with potash-ley, dilute sulphuric acid, and lumps of potash, begins to boil at 140°, after standing over chloride of calcium, then distils over till the temperature rises to 170° or even higher, while a thic dark-coloured residue remains. The portion which distils between 160° and 170° is Döpping's oil a. Potassium separates a small quantity of gas from it, probably because it contains water; if this oil be left in contact with quicklime for a week, and then rectified, it boils between 170° and 190°, and then forms the oil b. When oil of amber purified by hydrate of potash is mixed carefully and without heating, with several volumes of oil of vitriol, and the mixture is left at rest, it separates into two layers, the upper of which, if removed and washed with caustic

potash (if repeatedly treated with oil of vitriol, it would ultimately dissolve altogether), then brought in contact with quicklime and rectifed boils partly between 190° and 200° (oil c), and differs from the oils a and b, in odour, specific gravity, boiling point, and refracting power.—Between 210° and 220°, an oil d passes over, yellow and smelling like poppy-oil, whilst a yellow residue is left, which after cooling is solid and inodorous. (Döpping.)

3. Marsson obtained the oil which he examined, by rectifying crale oil of amber, dehydrating and de-acidising the distillate with pulveried

quicklime, and rectifying till \(\frac{1}{3}\) had passed over.

4. For the preparation of his amber-eupione (which appears to be identical win the hydrocarbon obtained by method 1 or 2.) Elsner mixes rectified oil of asker, gradually, with agitation, and avoiding rise of temperature, with 18 vol. oil of virial decants the layer which separates after standing for some time, washes it with sales, the standard of account and rectifies. dries out over chloride of calcium, and rectifies.

Properties. Transparent, colourless, or pale yellow, mobile or viscil oil, of no constant boiling point, and varying in specific gravity according to the temperature at which it has distilled; it alters partially in boiling point at each repetition of the distillation, and leaves a residue (on which account also its vapour-density cannot be determined.) (Dopping

vid. sup.)

Crude oil of amber varies in colour from yellow to brown-black (Anthon.) Sp. gr. 0.87—0.93 (Anthon); 0.91—0.936 at 20° (von Hee, N. Br. Arch. 61, 18); 0.85—0.89. (Zeller.) Sp. gr. of the crude al 0.9003 and 0.9219 at 15° (Marsson); of the rectified oil, 0.8795 at 16°; of the oil rectified with water, 0.8841 at 15°; of the most valuable distillate, 0.8403; of amber-empione, 0.645 at 19° (Elsner); of that which passes over between 180° and 190°, 0.9928 (Döpping); of the control of the distillate 0.8208; of the later distillate 0.82128. most volatile distillate, 0.8798; of the later distillate, 0.9176. (Marsson) Boiling point, 130° to 260° and higher; of amber-enpione, 280° (Elser); 130°—270° and higher (Pelletier & Walter); 160°—166° and higher (Marsson); 140°—170° and higher. (Döpping.)—Taste and odour pealiarly unpleasant and pungent.—Amber-enpione smells like ripe fruit (Elsner.) Neutral. (Döpping, Zeller.)

						Pell	etier &	Walte	7.
20		. 120			*******			89-1	9
16	Н	. 16	****	11-76	******	11:	30	10-1	0
C20]	H16	136	·	100.00		98-	59	99-2	9
	100	-117	1	Döpping mean.		-		3	Marrson.
	a.		ъ.		c.		d.		6.
C	87.03		87-97		87-48	1	87-32	********	86-67
O IIII	0,00								
н	11.54	****	11.53		12.06		11-98		11.70

Elsner found in rectified oil of amber 84.0 p. c. C, 8.6 H and 7.4 O; in saleeupione 84.55 p.c. C, 11.98 H and 3.47 O, whence he assigns to the latter, the formula C²⁰H²⁷O or C²⁰H²⁶O. Döpping and Marrsson regard Elsner's analyses as accorrect. Pelletier and Walter's formula, C¹⁸H¹⁴, requires 88.53 p. c. C and 11.47 H, (ccmp. page 323.)

Decompositions. 1. Oil of amber, even after rectification, leaves when distilled a dark brown viscid residue (amber-colophony). (Electrical distilled a dark brown viscid residue (amber-colophony).

Döpping.) - 2. It burns with a very smoky flame when set on fire. (Döpping.) — It does not absorb oxygen when exposed to the air. (Döpping.) — 3. Rectified oil of amber is coloured brown by iodine, but does not become heated (Elsner); it is partially resinised thereby. (Zeller.) — Amber-eupione dissolves iodine with red-brown colour. (Elsner.) - The volatile portions of rectified oil of amber, not yet treated (Elsner.) — The volatile portions of rectified oil of amber, not yet treated with oil of vitriol, acquire a transient blue colour when treated with chlorine, and finally give off hydrochloric acid, become viscid, and heavier than water; the less volatile portions are scarcely altered thereby. (Pelletier & Walter.) — 4. Oil of amber absorbs a small quantity of hydrochloric acid gas, acquiring a dark colour, but becoming colourless again, on addition of water. (Döpping.) Oil of amber treated with hydrochloric acid gas is altered in colour and smell, but does not form an artificial camphor. (Pelletier and Walter.) — 5. Oil of amber prepared by method 1, imparts a reddish colour to strong sulphuric acid, but remains itself colourless. (Pelletier and Walter.) Oil of amber prepared by 2, dissolves when repeatedly treated with oil of vitriol, partially each time, and completely in the end. (Döpping.) (For the behaviour of the time, and completely in the end. (Döpping.) (For the behaviour of the crude oil, and of the rectified oil not purified with oil of vitriol, see page 323.)

— 6. In contact with nitric acid, oil of amber acquires an odour of musk, and becomes resinised. (Marggraf, Ann. Chim. 73, 182.) The resin thus produced is the so-called artificial musk. — Nitric acid of sp. gr. 1.36 colours oil of amber cherry-red, and afterwards brown (Anthon); acid of sp. gr. 1.28 colours it violet (Zeller); more dilute acid colours it yellowish brown. (Döpping.) Cold fuming nitric acid or hot dilute nitric acid yields artificial musk. (Foltz, Repert, 4, 226, and others.) Fuming nitric acid colours amber-eupione dark red-brown, whereupon after a few hours, throws down artificial musk. (Elsner.) Respecting artificial musk, see especially Elsner, J. pr. Chem. 26, 97; Foltz, Report, 4, 226; Marsson, N. Br. Arch. 62, 8.) — When rectified oil of amber is boiled for 14 days with nitric acid of sp. gr. 1.3, an acid distillate is obtained containing acetic, propionic, and butyric acids, whilst a whitish yellow resin separates from the residue, and a larger quantity of it on addition of water. (Marsson.) It is to the presence of the volatile acids just mentioned, that artificial musk partially owes its odour. (Marsson.) — 7. Rectified oil of amber, and amber-eupione, do not act upon potassium. (Elsner; Pelletier and Walter.) Neither is purified oil of amber altered by aqueous potash or ammonia.

Combinations. Oil of amber dissolves at the heat of the hand in 50 pts. of alcohol of sp. gr. 0.855, likewise in 2 pts. of alcohol of sp. gr. 0.8 (Anthon), in 15 pts. alcohol of sp. gr. 0.85. (Zeller.) — The saturated solution, on cooling, deposits an oil which redissolves on the application of heat. (Anthon.) — Crude oil of amber yields to alcohol of 0.83, a dark yellow oil having a balsamic and penetrating odour (75.33 C, 14.04 H, 10.63 O); and from the residue, ether extracts a transparent kneadable resin (78.60 C, 12.82 H, 8.58 O), leaving a yellow crystalline residue (79.87 C, 14.92 H, 5.21 O), which burns without flame. (Drapiez, Schw. 30, 119.)

Oil of amber dissolves readily in ether (Elsner, Döpping), in 2 pts. of

ether (Anthon), in oils both fixed and volatile. (Elsner.)

Oil of amber, when heated, dissolves a large quantity of sulphur, which crystallises out on cooling; it dissolves a large quantity of caout-chouc, and a very small quantity of amber. (Döpping.)

2. Empyreumatic Oil of Birch.

Sobrere. (1842.) N. J. Pharm. 2, 207; Ann. Pharm. 44, 121.— N. J. Pharm. 3, 288.

Brenzliches Birkenöl. Essence de Bouleau.

Occurs in the tar obtained in Russia by the dry distillation of birthbark. — When the tar is distilled by itself, and the acid oil which floats on the watery distillate is repeatedly treated with potash-ley and rectified in a stream of carbonic acid, a colourless oil passes over at 156°, having a sp. gr. of 0.847, containing 88.05 p. c. C, and 11.95 H, therefore Calculation 88.23 p. c. C, 11.77 H); as the distillation proceeds and the boiling point rises, it becomes mixed with oxygenated oils containing less

carbon and hydrogen.

The oil which passes over at 156° solidifies partially at 16°—17°; has a vapour-density of 4.975 (calculation = 4.7144, [p. 245]), smells like oil of turpentine, but fainter and disagreeably.—It takes up oragen and resinises when exposed to the air; yields by distillation with natric acid a green oil (which loses its colour and deposits resinous flocks at 100), and 1—2 p. c. hydrocyanic acid; and when distilled with a mixture of 2 vol. nitric acid and 8 vol. water, becomes yellowish brown, thickers and sinks to the bottom of the distillate. It absorbs 32 p. c. hydrochloric acid gas, becoming black, but without forming artificial campber, and dissolves sparingly in water, easily in alcohol and in ether.

3. Caoutchin.

Himly. (1835.) Diss. Götting. 1835, 47; Ann. Pharm. 27, 41; abstr. Repert. 60, 105,
C. Greville Williams. Proceedings of the Royal Society, 10, 517.

Kautschin. Discovered and investigated by Himly; further by Williams.

Source and Extraction. Caoutchin occurs, together with many other substances in oil of caoutchouc. (Himly, vid. inf.) Obtained also from gutta percha. (Williams.) Oil of caoutchouc boiling at 140°—285°, obtained by fractional distillation, is repeatedly shaken up with dilut sulphuric acid, washed with water, then alternately with potash-lay and with water, and distilled with water several times. The liquid which passes over is dehydrated with chloride of calcium, and rectified per stand from this, by repeated rectification and removal of the portions which distil over below 166° and above 174°, caoutchin is obtained, believe between 168° and 171°. By repeated fractional distillation, this product may be brought to boil at 171°; or the purification may be effected by passing dry hydrochloric acid gas into the cooled oil previously dried over chloride of calcium (whereupon it turns blackish green), whereby hydrochlorate of caoutchin is formed, decanting this liquid from the resin after it has stood for several days, dissolving it in absolute alcohol, and presidents.

pitating with water. The hydrochlorate of caoutchin again dehydrated and repeatedly distilled over caustic lime or baryta, then over potassium as long as the metal becomes coloured, yields pure caoutchin. (Himly.)

Properties. Transparent, colourless, mobile; makes grease-spots on paper which soon disappear, leaving a faint odour. Sp. gr. 0.8423 at 16°. Boiling point 171.5° at 0.75 met. pressure. Does not solidify at — 39°. Vapour-density 4.461 (Himly); 4.65 (Williams). Has but little electric conducting power. Smells like oil of China oranges (Apfelsinenöl p. 304), but less agreeably. Has a peculiar aromatic taste, burning but not bitter. (Neutral, Himly.)

20 C 16 H						0	Williams 88·1 11·9
C20H16	136	****	100.00		98.6	66	100.0
				Vol.		Densit	y.
C-vap	our			20 .		8.3200)
						1.1088	3
Caout	chin-	rapo	ur	2 .		9-4288	3
-	7	100				4.7144	

Williams's numbers are the mean of three analyses, two of which were made with caoutchin obtained from gutta percha.

Decompositions. 1. Caoutchin volatilises partially when exposed to the air, leaving a residue produced by absorption of oxygen; by prolonged contact with the air, it acquires a persistent bitter taste, and is finally converted into a yellow, tough, bitter resin (which appears to contain nitrogen). Caoutchin kept for a year in bottles containing air and not quite closed, does notdeposit crystals, but becomes yellow, bitter, and less soluble in alcohol and ether than before; it gives off gas-bubbles with potassium, often with a rapidity amounting to ebullition; and is for the most part decolorised by agitation with aqueous potash, yielding to it a bitter substance. (Himly.) Peroxide af hydrogen converts caoutchin into a resin. (Himly.) — 2. With chlorine it turns brown, becomes heated to inflammation, gives off hydrochloric acid, and forms chlorocaoutchin. — 3. With bromine, it gives off hydrobromic acid, with effervesence, but remains colourless and transparent; it readily abstracts bromine from its solutions in water, alcohol, and ether, forming heavy drops of oil. Caoutchin mixed with \(\frac{1}{5}\) vol. water decolorises bromine till 248 pts. bromine have been added to 100 pts. caoutchin (Williams, Chem. Gaz. 263, 365; J. pr. Chem. 61, 20); according to more recent determinations by Williams (Proc. Roy. Soc. 10, 517), 0·1091 grm. caoutchin decolorises by Williams (Proc. Roy. Soc. 10, 517), 0·1091 grm. caoutchin decolorises by Williams (Proc. Roy. Soc. 10, 517), 0·1091 grm. caoutchin (williams.)]

4. By the alternate action of bromine and sodium on caoutchin [or oil of turpentine], 2 At. hydrogen are removed, and cymene, C²⁰H¹⁴, is produced, having exactly the same odour as that obtained from oil of cumin (p. 184). (It gave as the mean of three malyses 89·4 p. c. C and 10·4 H.) At the same time there is produced an oil (paracymene) having the composition of cymene but boiling at 300°. (Williams, Proc. Roy. Soc. 10, 517.) — 5. With iodine, caoutchin acquires a black brown colour, especially when heated; a

is a black-brown oil, giving off hydriodic acid when distilled, easily decomposed by heating with oil of vitriol, bromine, chlorine, funing nitric acid, or potash, nearly insoluble in water, but soluble in alcohol and ether. Caoutchin, distilled with excess of iodine, forms a colourless, fragrant oil, similar to that which is produced by the action of oil of vitriol on caoutchin, giving off at the same time a large quantity of hydriodic acid. (Himly.) -6. With nitric oxide, caoutchin gradually turns yellowish; with nitrous acid, yellow and green, and is gradually converted into a very sharp and bitter-tasting yellow resin, soluble in alcohol and ether. — 7. It is not altered by dilute nitric acid; but concentrated nitric acid colours it rose-red, yellow, blue, then again yellow, with rise of temperature, evolution of nitric acid, and formation of a yellow resin; fuming nitric acid acts still more strongly. The yellow resis yellow resin; fuming nitric acid acts still more strongly. The yellow make thus formed is brittle at 0°, tough and ductile when moderately heated, melts at a stronger heat, swelling up and giving off white, very offensive vapoures, and altimately takes fire, burning with flame, and leaving a large quantity of spongy charcoal; dualid with potash, lime, or baryta, it gives off ammonia having an empyreumatic odour; it dissolves very readily in aqueous potash, carbonate of potash, and ammonia, such in alcohol both hot and cold, and is separated by water from the hitter solution in the form of a yellow powder; when repeatedly distilled with fuming nitric acid, it ferms oxalic acid.—8. Caoutchin gradually heated with concentrated aqueous chloric acid, becomes hot, and forms chlorocaoutchin and perchloric acid.—9. It is decomposed by india acid.—10. Boiled with crustals of chromic - 9. It is decomposed by iodic acid. - 10. Boiled with crystals of chromic acid, it forms a yellow resin. - 11. When dropt into oil of vitriel, it becomes heated, eliminates sulphurous acid, and forms a brown uncluses acid, yielding with carbonate of baryta, a soluble baryta-salt, which, when decomposed by sulphates, forms non-crystalline salts, soluble in water. (Himly.) The formula of this acid is C²⁰H¹⁶S³O⁶; its lime-salt gave by analysis 8.3 p. c. calcium, the formula C²⁰H¹⁸CaS²O, requiring 8.5 p. c. (Williams.) Caoutchin is coloured red-brown to black by oil of vinid, becoming viscid, giving off sulphurous acid, and separating after 24 hours, a coloured oil floating on the surface which appears to be impure cupione. This oil, washed waster and dehydrated with chloride of calcium, has a specific gravity of 0.86, holls at 20.32 calcium, and the coloured with chloride of calcium, has a specific gravity of 0.86, holls at 20.32 calcium. water and denydrated with entoride of calcular, has a specime gravity of vol. 203°, smells like rock-oil, has an aromatic taste, volatilises without alteration, and is neutral; it is not decomposed by fuming nitric acid, absorbs only a small quantity of hydrochloric acid gas, is but slightly altered by boiling with oil of vitriol, and disserve in alcohol in all proportions. When the thick acid liquid below this oil is mired. in alcohol in all proportions. When the thick acid liquid below this oil is missiwith water, and left at rest, an oil separates from it and collects on the surface of the This latter oil has an odour different from that of caoutchin, aromatic las that of rosemary; it is soluble in alcohol, still more in ether, and yields by distillation a strong-smelling oil, easily soluble in alcohol and other, decomposed by fuming nitric acid and hot oil of vitriol,—also a resin, which separates from its ethercal solution of addition of alcohol, as a yellow, inodorous and tasteless powder, which melts below 100°. Dilute sulphuric acid does not act upon caoutchin.—12. Caoutchin, boiled with selenic acid of sp. gr. 2.23 turns brown, and gradually decomposes. -13. It is not decomposed by phosphoric or phosphorous acid. — 14. With dry hydrochloric acid gas, it becomes hot, acquires a brown colour, and is converted into hydrochlorate of caoutchin. - 15. Hydriodic and Andrebromic acids act in like manner. — 16. With arsenic acid it turns yellow, blackens on boiling, and leaves an insoluble residue. — 17. Distilled with potassium, it gives off a few gas-bubbles, covers the metal after a while with a grey film, then remains unaltered; it is likewise unaffected by sodium, potash, soda, baryta, or lime. - 18. It converts cupric oxide an boiling into cuprous oxide; permanganate of potash, on boiling, into per-oxide of manganese; but exerts no de-oxidising action, even at the boiling heat, on protoxide of lead, minium, peroxide of lead, mercuric oxide, or chromate of potash. 19. Heated with terchloride of gold or bichloride of

platinum, it gives off hydrochloric acid and forms chlorocaoutchin.—20. With terchloride of antimony, it turns yellow, and on boiling, dark green, and forms impure hydrochlorate of caoutchin. Similarly when boiled with mercuric chloride, it forms hydrochlorate of caoutchin; with mercurous chloride, no action takes place.—21. With sesquichloride of iron, it forms a black-brown mixture.

Combinations. Caoutchin absorbs in 14 days, 45 vols. oxygen, without becoming saturated; in 3 weeks, at 20°, it absorbs 2 vols. oxygen.

It dissolves in 2000 pts, of water. It takes up a small quantity of water in the cold, and at higher temperatures, a larger quantity, which separates on cooling. It may be dehydrated by agitation, but not by distillation with chloride of calcium.

It does not absorb carbonic oxide, marsh gas, or olefant gas, but takes up 11 vols. carbonic acid. Caoutchin, saturated with carbonic acid,

absorbs oxygen and evolves in 3 weeks 6 vols, carbonic acid.

Of phosphorus, it dissolves a small quantity in the cold, more when heated. The hot solution, which shines in the dark, deposits the greater part of the phosphorus on cooling, at first in fused globules, afterwards in small rhombohedrous.

Of sulphur, it dissolves a little in the cold, ½ pt. when heated. The hot solution deposits on cooling, slender shining needles, and at last octohedrons, still however retaining in solution a quantity of sulphur larger than that which caoutchin can take up in the the cold. Caoutchin does not absorb sulphuretted hydrogen, but dissolves bisulphide of carbon in all proportions. Selenium and selenious acid do not dissolve in caoutchin.

With Hydrochloric Acid. Hydrochlorate of Caoutchin. Monochlorhydrate de caoutchine liquide. (Gerhardt.) Caoutchin cooled with ice is completely saturated with dry hydrochloric acid gas, and the dark brown liquid, which is transparent only in thin layers and fumes strongly in the air, is shaken up with water, to remove free hydrochloric acid.

Brown. Sp. gr. 0.95 at 15°. Does not solidify at 39°. Odour strongly but repulsively aromatic, like that of thyme; persistent; taste, mild but

disagreeable.

When set on fire, it burns with a red, strongly fuliginous flame, green at the edges. Gives off hydrochloric acid gas when distilled. Treated with chlorine or bromine, it gives off hydrochloric acid gas, and is converted into chloro- or bromo-caoutchin. It is not decomposed by aqueous potash or soda, but when distilled over lumps of potash, soda, lime, or baryta, it gives up its hydrochloric acid to the alkali.

It dissolves in absolute alcohol, in ether, and in acetate of ethyl, but on adding water or weak alcohol to either of these solutions, the whole of

the caoutchin is precipitated.

With Hydrobromic Acid, caoutchin forms a compound analogous to the hydrochlorate; also, but less easily, with hydriodic acid. Caoutchin dissolves in the cold a small quantity of iodide of sulphur; the solution, when boiled, gives off sulphuretted hydrogen, and leaves a black thick residue. It dissolves a small quantity of iodide of phosphorus, forming a brown solution which is decolorised by water. From an aqueous solution of bromide of iodine, it withdraws the whole of that compound, forming a bluish-green balsam, in which neither bromine nor iodine can be detected by metallic silver. It does not dissolve mercuric iodide in the cold; but with the aid of heat, it forms a yellow solution which, on cooling, deposits almost all the mercuric iodide in yellow scales, which after a while become red again.

It absorbs in five weeks 5 vols. nitrogen, a small quantity of nitrou oxide, and assumes a yellowish tint after some time by contact with nitric oxide. It absorbs 3 vols. ammonia gas. It does not unite with aqueous ammonia. It does not absorb cyanogen gas, but hydrocyanic acid gas is absorbed by it, and chloride of cyanogen, in almost any quantity.

absorbed by it, and chloride of cyanogen, in almost any quantity.

It dissolves a small quantity of iodide of carbon when heated therewith, and deposits it in shining laminæ on cooling. When boiled with iodic of carbon, it turns brown. It dissolves with facility the chlorides of carbon, sulphur, and phosphorus. Mixes in all proportions with xanthic acid.

Caoutchin is slightly soluble in concentrated formic and acetic acide. The solutions prepared with aid of heat, deposit on cooling nearly the whole of the caoutchin in combination with formic and acetic acids. Caoutchin dissolves radial acid in very small quantity; oxalic, citric, and tartaric acids, not at all. All these acids, boiled for some time with caoutchin, produce a brown glutinous substance. Caoutchin, with aid of heat, dissolves a large quantity of benzoic acid, which partially separates in the crystalline state on cooling. It does not dissolve tannic, mucic, or succinic acids.

Caoutchin dissolves in all proportions in absolute alcohol, ether, and acetate of ethyl, but is not soluble in chloride of ethyl. The alcoholic solution deposits part of the caoutchin on addition of weak alcohol, and the whole when mixed with water. From the ethereal solution, water does not separate the caoutchin, unless alcohol is likewise added. The alcoholic solution burns, when set on fire, with a bright flame, which, if the right proportions have been chosen, does not deposit any soot.

Caoutchin dissolves in oils both fixed and volatile.

Appendix to Caoutchin.

1. Chlorocaoutchin.

HIMLY. (1835.) Dissertation, Göttingen, 1835, 79.

by boiling caoutchin with terchloride of gold or bichloride of platinum.

Preparation. Dry chlorine gas is passed into a flask having a layer of caoutchin at the bottom, the delivery-tube not however reaching to the surface of the liquid, but terminating a few lines above it, and the mixture being at first cooled with ice; and the resulting oil, — which is brown at first, but, when completely saturated with chlorine, become colourless and viscid, and gives off a larger quantity of hydrochloric and gas, — is washed with a very weak soda solution, then with water, and finally dehydrated over oil of vitriol.

Properties. Transparent, colourless, viscid. Sp. gr. 1'433. Does not become crystalline on cooling. Has a peculiarly strong ethereal odour, and an intolerably and persistently sharp, burning taste. Neutral.

Decompositions. 1. When distilled, it gives off extremely irritating hydrochloric acid vapours.—2. Boiled for some time with oil of vitriol, it gives off hydrochloric acid and becomes carbonised.—3. By distillation with potash, lime, or baryta, it yields a variety of oily products.

Combinations. It dissolves in hot nitric acid and in hot oil of vitriol,

separating out unchanged on cooling.

It dissolves sparingly in water, easily in alcohol and ether, and is precipitated from its alcoholic solution by water.

¶ 2. Isoprene. C'oH's.

C. G. WILLIAMS. (1860.) Proceedings of the Royal Society, 10, 516.

Produced, together with caoutchin, by the dry distillation of canotchouc and gutta percha; purified by repeated cohobation over sodium.

It is an exceedingly volatile liquid, of sp. gr. 0.6823 at 20°. Boils between 37° and 38°. Vapour-density 2.44.

					V	Williams,				Density.	
				88·23 11·77		88.0 C-vapour					
C10H8	****	68	****	100-00		100.1	Vap, of Isoprene			4·7144 2·3572	

This experimental composition is the mean of five analyses, three of specimens from caoutchoue and two from gutta percha. Isoprene is polymeric with caoutchin being related to it in the same manner as amylene to paramylene. From the similarity of composition between isoprene, caoutchin, and pure caoutchoue, Williams is of opinion, that the decomposition of caoutchoue by heat is simply the disruption of a polymeric body into substances having simple relation to it.

Oxide of Isoprene, C10H6O. Isoprene exposed to the air for some months, thickens, and acquires bleaching properties, owing to the absorp-tion of ozone. On distilling the ozonised liquid, a violent reaction takes place, the unaltered hydrocarbon distils off, and the residue solidifies to a pure white, amorphous mass, containing :

				Williams.				
8 H	 8	****	78·95 10·52	*******	10.7			
O C10H8O	 -	-	100.00	-	THE REAL PROPERTY.			

Borneol or Borneol-alcohol.

C20H18O2 = C20H16,2HO.

Pelouze. (1841.) Compt. rend. 11, 365; Ann. Pharm. 40, 326; abstr.

Gerhardt. N. Ann. Chim. Phys. 56, 78; abstr. Compt. rend. 14, 832; J. pr. Chem. 27, 379; J. Pharm. 26, 645; Repert. 72, 364.

Gerhardt. N. Ann. Chim. Phys. 7, 286; Ann. Pharm. 45, 38; abstr. Compt. rend. 14, 832; J. pr. Chem. 27, 124; further, 28, 46.

Berthelot. N. Ann. Chim. Phys. 56, 78; abstr. Compt. rend. 47, 265; Ann. Pharm. 110, 267; Repertoire de Chimie pure, 1, 64; Ann. Pharm. 112, 363.

Relating especially to the Modifications of Borneol: JRANJEAN. Compt. rend. 42, 857; further, 43, 103; J. pr. Chem. 69, 204; Ann. Pharm. 101, 94; Chem. Centralbl. (1856.) 575 and 672.

Oxyde de Bornène. (Laurent.) Camphol, Alcohol campholique. (Bertheld.)
Fester Borneo-camphor, Camphre solide de Borneo; Baros-campher, Sumatra-campher, Dryobalanops-campher, Camphora Sumatrana, C. Borniensis, C. Malagant

Source and Formation. 1. In the cavities of old stems of Drys-Source and Formation. 1. In the cavities of old stems of Drybalanops Camphora (Colebrooke), a tree growing in Sumatra, especially in the province of Baros, more rarely in Borneo. (De Vriese, Nederlandel. Kruidkundig. Archiff, 3, 1; Hooker's Journal of Botany, 1852, 33 and 68; abstr. Pharm. J. Trans. 12, 22; v. Kessel, Wien. Akad. Ber. 8, 418.) It is scooped out of fissures in the stems of hewn trees with small pieces of wood or nails. (De Vriese.) It occurs in the cavities of the stems generally mixed with eamphor-oil (p. 314), and as a crystalline sublimate in the upper part of the cavities, then they are not quite filled with the oil. (Motley, Pharm. J. Trans. 12, 300.)

2. Oil of valerian contains borneol (and the other constituents mentioned at page 313), which, on rectifying the most volatile portions, sometimes, but not always, sublimes in the neck of the retort; hence it appears to be produced occasionally from valerene by the action of hydrate of potash, just as it is obtained (p. 313), sometimes abundantly, sometimes but sparingly, on setting aside a mixture of valerene and potash-ley, and subsequently distilling it. (Gerhardt.) The crystals thus obtained are not borneol, but valerian-camphor, C²⁴H²⁰O², either existing ready formed in the oil of valerian, or produced from the valerol by distillation. (Pierlot, N. Ann. Chim. Phys. 59, 291.) This view does not agree with Gerhardt's analyses; moreover, both Gerhardt and Rochleder obtained from oil of valerian, common camphor, which probably can be produced only from borney.

3. From common Camphor. When camphor is heated with alcoholic potash, borneol is produced, either with evolution of oxygen :

or with simultaneous formation of camphic acid:

slowly at 100°, more quickly at higher temperatures. (Berthelot.) When 2 pts. of common camphor are scaled up in a tube with 1 pt (Berthelot.) hydrate of potash or soda and 5 — 6 pts. alcohol, and heated in the obbath to 180° — 200° for 8 or 10 hours, or to 100° for several weeks, a product is obtained from which water separates an oil, and a solid mixture of borneol and common camphor. The oil decanted and filtered, and submitted to fractional distillation, yields, below 240°, an additional quantity of this mixture, a viscid oil afterwards passing over, and a residue being left in the retort. This mixture may be purified from oil by pressure and sublimation, and then contains about 10 per cent. of common camphor with 90 per cent. of borneol. To remove the former, the mixture is heated with 2 pts. of stearic acid To 200° for several hours (or to 160°—180° for several days), whereby the common camphor is volatilised: the residual stearate of borneol is decomposed by heating it to 120° with ½ pt. finely pulverised soda-lime, and the borneol which sublimes in the neck of the retort, leaving a residue of stearate of lime, is collected: it amounts to about ½ of the camphor employed.

Properties. Small, white, transparent, easily friable crystals (Pelouze, Gerhardt, Berthelot); six-sided rhombohedral prisms. (Pelouze.) Native borneol forms small lumps of round and oval shapes, flat, white, thin, and \(\frac{1}{2}\) inch in diameter, mixed with very small dirty white granules. (v. Kessel.) Lighter than water. (Pelouze.) According to Christison, it is heavier than water. (N. Br. Arch. 48, 32.) Melts at 198° (Pelouze), less easily than common camphor. (Gerhardt.) Boils without decomposition at 212° (Pelouze), a little below 220° (Berthelot.) It is less volatile than common camphor. (Gerhardt, Mosley.) Sublimes even at common temperatures, and boils at a temperature not far from its melting point. (Berthelot.) Rotatory power of native borneol 33.4° to the right (Biot, Compt. rend. 11, 370), of the artificial, 44.9° to the right. (Berthelot.) Borneol, prepared with camphor obtained from oil of amber, exhibits 10 times less dextro-rotatory power than artificial borneol. (Berthelot.) Borneol smells like common camphor and at the same time like pepper (Pelouze, Gerhardt, Berthelot); its odour is more agreeable (Motley); it has a burning taste like a volatile oil. (Pelouze.)

					Gerhardt.	I	Berthelot.
20 C	120	****	77.92		77.69	****	77.6
18 H	18	****	11.69	*******	11.85		11.6
20	16		10.39		10.46		10.8
C20H18O2	154		100.00		100.00		100.0

Gerhardt examined borneol from oil of valerian; Berthelot, that from common camphor. — Borneol is related to common camphor in the same manner as alcohol to aldehyde.

Decompositions. 1. Borneol heated with moderately concentrated nitric acid, gives off red vapours, and is converted into an oil which floats on the acid, and from which water separates common camphor. A similar decomposition takes place, slowly in the cold, more quickly and violently with strong nitric acid. (Pelouze, Berthelot):

$$C^{20}H^{18}O^2 = 2H + C^{20}H^{16}O^2$$
.

-2. By distillation with anhydrous phosphoric acid, it is resolved into water and a hydrocarbon C²⁰H¹⁶ (Pelouze), which, according to Gerhardt, is identical with his borneene and that of Pelouze (p. 313).—3. Heated with moderately strong hydrochloric acid, it forms hydrochlorate of

borneol. Slightly heated borneol, or its cold alcoholic solution, absorbs but a small quantity of hydrochloric acid gas. (Berthelot.) — 4. Heated for some time to 200° in a sealed tube with benzoic acid, it forms benzoate of borneol; with stearic acid, stearate of borneol. (Berthelot.)

Borneol dissolves sparingly in water (Pelouze); not at all. (Berthelot.) — It dissolves readily in alcohol and in ether. (Pelouze, Berthelot.) — From a solution of 2 pts. borneol in 10 pts. absolute alcohol, 100 pts. of water separate, after three days standing, 1.2 pts. of borneol, and on agitating the liquid with ether, the ether takes up an additional 0.6 pt. of borneol. (Berthelot.)

Compounds Isomeric with Borneol.

Lævo-rotatory Borneol.

Occurs in the alcohol produced by fermentation of madder-sugar, and is obtained by collecting the lamine which crystallise out from the liquid on standing, or in the fractional distillation conducted as described at page 313. It is pressed between filtering paper, and then purified by washing with a large quantity of water and repeated crystallisation from ether. (Jeanjean.) - It appears to be produced from the borneene of madder fuel-

(Jeanjean.)

Properties. Crystalline laminæ resembling borneol, or white powder smelling like pepper and common camphor, It deflects polarised light to the left as much as ordinary borneol deflects it to the right.

		1	Teanjean.
			mean.
20 C	77-92		77-76
18 H	11.69		12.05
20	10.39	*******	10-19
C20H18O2	100.00	10000	100.00

Decompositions. 1. Lavo-borneol is converted by boiling nitric acid into levo-rotatory camphor isomeric with common camphor. — 2. Distilled with anhydrous phosphoric acid or chloride of zinc, it yields a hydrocarbon resembling oil of lemon or oil of bergamot. (Jeanjean.) Valerene (p. 313).

Combinations. Sparingly soluble in water. - Rotates like communications camphor when thrown on water. - Dissolves readily in acetic ucid, is

alcohol, and in ether. (Jeanjean.)

2. Oil of Cajeput.

Pfuff. System de Mat. med. LEVERKÖHN. Repert. 34, 129 Schönfelder. Repert. 36, 132. GUIBOURT. J. Chim. méd. 7, 586; Repert, 39, 261. DÖBEREINE. Schw. 63, 484. BLANCHET. Ann. Pharm. 19, 214. ZELLER. Stud. über äther. Oele, Landau, 1850.

Essence de Cajeput, Cajeputol, Oleum cajeputi.

Source. In the leaves (also in the flower-buds, according to Lesson), of Melaleuca trinervis, M. leucodendron (Dec.), M. Cajeputi (Boab.)

Extraction. By distilling the leaves with water (after they have become heated by being left over night closely pressed in a sack: Rump.) The water which passes over with the oil reddens litmus. (Schönfelder.) — From the leaves of Melaleuca hypericifolia, Stickel obtained by distillation with water, 0.4 p. c. cajeput-oil.

Properties. Pale green (Gärtner, Blanchet, Stickel); grass-green (Döbereiner); greenish yellow to pale green (Zeller, vid. inf.); after rectification with water, the first \(^2\frac{1}{4}\) are transparent and colourless, the last \(^1\frac{1}{4}\) green (Schönfelder), the first \(^2\frac{1}{4}\) transparent and colourless (Dobereiner, Blanchet), the last \(^1\frac{1}{3}\) pale to dark olive-green (Guibourt), transparent and colourless (Döbereiner, Blanchet); after agitation with animal charcoal, it is transparent and colourless (Vasmer, Br. Arch. 37, 248); transparent (Döbereiner, Blanchet, Stickel); mobile. (Pfaff.) Sp. gr. 0.978 at 9° (Gärtner), 0.915 (Schönfelder), 0.9492 at 18° (Döbereiner), 0.9274 at 25° (Blanchet), 0.916—0.919 at 18°, 0.913 at 24° (Guibourt), 0.91—0.94 (Zeller); rectified with water: first distillate 0.907 (Schönfelder), 0.897 (Leverköhn), 0.9196 at 25° (Blanchet), last 0.917 (Schönfelder), 0.92 (Leverköhn). — Boiling point 175°. (Blanchet.) The first distillate boils at 173°, the last at 175° (Blanchet), the most volatile nearly at 100°. (Döbereiner.) — Odour pungent, like that of camphor (Pfaff); aromatic, fainter after rectification. (Blanchet.) — Cajeput-oil from Amboina smells like turpentine, camphor, peppermint, and roses; that from Paris, like rue and rosemary; after rectification with water, it has a pungent odour rather like turpentine than acid; the latter distillate is less pungent, more like that of rose-wood or aloe-wood. (Guibourt.) — Taste burning (Pfaff), warming. (Blanchet.) — Neutral to litmus. (Schönfelder, Zeller.)

C20111	8O2	154		100.00	Lancia L	100.00
20		16	****	10.39		10.52
18 H		18	100	11.69	*******	11.48
20 C	******************	120	****	77.92		78.00

Consists of two volatile oils (Leverköhn); of dadyl (p. 245) and water, in equal numbers of atoms = C¹⁰H⁸, HO (Blanchet.) Commercial cajeput-oil generally contains copper in solution, whereby its original green colour is deepened (Stickel); it exhibits a greenish colour, however, even when no copper is present. (Guibourt.) The copper which gets into the oil, when it is sent out in copper vessels, cannot according to Dobereiner, be always recognised by its usual character of imparting a blue colour to aqueous ammonia on agitation; it is also not easily precipitated from the oil by potassium, iron or zinc, but better by the electric current. When the polar wires of a voltaic battery are dipped into cajeput-oil mixed with water, the positive pole, if the oil contains copper, becomes covered with cuprous oxide, and the wire at the negative pole gives off hydrogen; if aqueous ammonia be added, gas is evolved at both poles, flakes of copper are likewise formed at the negative pole, and the oil turns yellow. — Copper dissolved in the oil may also be detected by shaking it up with aqueous ferrocyanide of potassium, which produces a red precipitate of ferrocyanide of copper. (Guibourt.)

Copper may be removed from the oil by distillation, inasmuch as it passes over only with the last portion of the distillate (Schönfelder and others); by agitation with animal charcoal (Vasmer, Br. Arch. 37, 348).—A sample of enjeput-oil from Paris contained according to Guibourt, 0.22 p. c. of copper.

Decompositions. 1. Crude cajeput-oil, when heated, yields a colourless distillate, and leaves a resin which colours ammonia blue, and burns away completely when set on fire (Blanchet); when distilled with water, it leaves a dark green syrupy mass which smells like aloe-wood or elemi, and is nearly as heavy as water. (Guibourt.)—2. It dissolves iodina without explosion (Blanchet), giving off a small quantity of yellowish red vapours, and exhibiting a slight rise of temperature; the rectified of forms with iodine, a greenish brown cougulum, which changes to a dry crumbling mas. (Zeller.)—3. Mixed with an equal quantity of nutric acid, it acquires a brown or black-brown colour without losing its odour (Bonastre, J. Pharm. 11, 129); becomes blaish-red if heated, and gives off gas with violence (Zeller); forms, with crackling noise, a soft yellow resin. (Hesse, Crell. Ann. 1785, I, \$22)—Nitro acid has no action upon cojeput-oil. (Blanchet.)—4. With cold oil of vitriol, it turns yellow (Blanchet), orange, then carmine-red, with evolution of sulphurous acid (Döbereiner), brown-red, forming a balsam which gradually becomes black-brown. (Pfaff.)—5. It absorbs hydrochloric acid gas, acquiring a blue, violet, and finally an amethyst-red colour.—Cajeput-oil coloured amethyst-red by hydrochloric acid gas, turns violet in moist air, and when mixed with alcohol, deposits a heavy oil, and turns dingy yellow. (Döbereiner.)—6. Potassium abstracts oxygen from cajeput-oil more strongly than on oil of turpentine; the evolution of gas, which is weak even at first, soon ceases. (Döbereiner.)—7. Green oil of cajeput becomes yellow by contact with aqueous ammonia (Döbereiner), sometimes quite colourless (Guibourt), the ammonia likewise remaining colourless (Döbereiner), assuming various shades from greenish blue to blue (if the oil contains copper.) (Guibourt.)—9. Boiled with ris of corposive sublimate, calomel is separated, and turns brown. (Heppe, N. Br. Arch. 89, 57.)—10. When it is continuously agitated with ris of corposive sublim

Cajeput-oil dissolves readily in alcohol. (Guibourt, Zeller.)

3. Oil of Coriander.

TROMMSDORFF. N. Br. Arch. 2, 14.

KAWALIER. Wien. Akad. Ber. 9, 313; J. pr. Chem. 58, 226; abst.

Ann. Pharm. 84, 351; Chem. Centralbl. 1852, 746; N. J. Pharm.
23, 479.

Source and Extraction. In coriander, the fruit of Coriandess sativum. L. — The bruised fruits are distilled with water.

Properties. Colourless oil (Trommsdorff), pale yellowish. (Kawalier.) Sp. gr. 0.859 (Trommsdorff), 0.871 at 14°. (Kawalier.) Boiling point 150° (but not constant). (Kawalier.) — Smells like coriander, but more agreeably; tastes aromatic, but not burning (Trommsdorff), like coriander. (Kawalier.) Neutral. (Trommsdorff.)

					Kawaner.						
					a.		b.		c.		d.
20 C	120		77.92	•••••	77.82		77.73		85.67	••••	85.47
18 C	18	••••	11.69		11.67	••••	11.63		11.58	****	11.59
2 0	16	••••	10.39	•••••	10.51	••••	10.64	••••	2.75	••••	2.94
CathreOs	154		100:00		100:00		100:00		100:00		100:00

s. Oil dried over chloride of calcium and rectified; b. Its most volatile part; both according to Kawalier, are isomeric with liquid turpentine-camphor. c. The most volatile product of an oil merely dehydrated with chloride of calcium, but not heated to the boiling point; d. The oil distilled therefrom at 200° ; both c and d, according to Kawalier, are composed according to the formula $C^{80}H^{66}O^2 = 4C^{20}H^{16} + 2HO$ or $2C^{90}H^{16} + 2C^{20}H^{16}$, HO).

Decompositions. 1. The oil explodes strongly with iodine. — 2. With 2 pts. of funning nitric acid, it forms a yellow resin (Hesse, Crell. Ann. 1, 422), a greenish resin having a peculiar odour, and becomes very hot. (Trommsdorff.) — 3. Mixed with oil of vi/riol, it yields a saffron-yellow liquid, which gradually becomes dark red and ultimately brown red, and chars rapidly when heated. (Trommsdorff.) — 4. When repeatedly distilled over anhydrous phosphoric acid, it is converted into a yellowish offensive-smelling oil isomeric with oil of turpentine (containing 88.28 p. c. C, and 11.78 H). (Kawalier.)

Combinations. With Hydrochloric Acid. C²⁰H³⁵Cl²O. (Kawalier.) Dry hydrochloric acid gas is passed into coriander-oil cooled with ice; and the oil which remains liquid after saturation, is washed with aqueous soda, then with water, and dehydrated by agitation with chloride of calcium. (Kawalier.)

Calculation according	Kawalier.				
40 C	240		67.81		67.51
35 H	35		9.89		10.00
2 Cl	71		20.04		20.40
0	8	••••	2.26		2.09
(C ²⁰ H ¹⁶ ,HO + HCl) + (C ²⁰ H ¹⁶ ,HCl)	354		100.00		100.00

Coriander-oil dissolves readily and abundantly in glacial acetic acid, alcohol, ether, and fixed oils. (Trommsdorff.)

4. Oil of Osmitopsis.

GORUP-BESANEZ. (1854.) Ann. Pharm. 89, 214; abstr. J. pr. Chem. 61, 513; Chem. Centralbl. 1854, 299.

Osmitesöl, Essence d'osmitopsis.

Source. In Osmitopsis asteriscoïdes, a South African plant.

Properties. Yellow or faintly greenish; that which distils between 178° and 188° is colourless, mobile, and feels rough between the fingers. Sp. gr. 0.931 at 16.2°; 0.921, rectified at 178°—188°. Boiling point not constant, but ranging chiefly between 176° and 188°. It begins to toll slightly at 130°, boils regularly at 176°, two-thirds distilling over rapidly at 178°. It does not solidify on cooling. Odour penetrating, mapleasantly like camphor and cajeput-oil; more delicate, after rectification between 178° and 188°. Has a burning taste, and produces a scratching sensation in the throat. Neutral.

				Gorup-Besan				
20 C	120	****	77-92		77:36			
18 H	18	10006	11.69	******	11.23			
20	16	1000	10.39	-mini	11-11			
C20H18O2	154	inc	100.00		100-00			

Decompositions. 1. The crude oil when distilled finally gives of a yellowish liquid between 188° and 206°, afterwards camphor sublimes between 207° and 208°, and a dark-coloured resin remains. - 2. With cold nitric acid, it remains unaltered, but with the hot acid a violent evolution of nitrous gas takes place. — 3. It turns brown with oil of vitriol. — 4. With potassium, it gives off a small quantity of gas, the metal at the same time becoming oxidised. - It does not form a hydrocarbon by distillation with alcoholic potash. — 6. From ammonian silver-solutions, it reduces the metal only after long-continued boiling. — 7. It dissolves iodine without explosion.

Combinations. - It dissolves in all proportions of alcohol and ether. -It is nearly insoluble in water, but forms with it a turbid liquid having the odour of the oil.

Camphor.

$C^{20}H^{16}O^2 = C^{20}H^{16}O^2$

Hanel. (1703.) Diss. de camph. Lugd. E. 1703. Demachy. Dessen. Laborant in Grossen. 1, 242. Ferber. Beiträge zur Mineralgeschichte, 1, 370. Kosegarten. Diss. de camphora, &c., Gött. 1785. Bouillon Lagrange. Crell. Ann. 1799, 2, 301.

SAUSSURE. Ann. Chim. Phys. 13, 275; Schw. 28, 389; further, 29, 178 N. Tr. 5, 2, 112.

Dumas. Ann. Chim. Phys. 48, 430; further, 50, 225; Pogg. 26. 551; Ann. Pharm. 6, 259; Schw. 66, 89.

LIEBIG. Pogg. 20, 45; Ann. Chim. Phys. 47, 95.

BLANCHET & SELL. Ann. Pharm. 6, 304.

LAURENT. Ann. Chim. Phys. 63, 207; Ann. Pharm. 22, 135; J. p. Chem. 11, 287. — Compt. rend. 10, 532; J. pr. Chem. 20, 498. — For scient. 11, 263; J. pr. Chem. 28, 333. — N. Ann. Chim. Phys. 7, 20. -Compt. chim. 1845, 150. - Compt. rend. 20, 511. - Rev. see 19, 159.

Martius. Ann. Pharm. 25, 305; further, 27. 44. - N. Repert, 1, 541.

Dumas & Stas. N. Ann. Chim. Phys. 1, 48; Ann. Pharm. 38, 184. Delalande. N. Ann. Chim. Phys. 1, 120; J. pr. Chem. 23, 387; Ann. Pharm. 38, 337.

DUTROCHET. Compt. rend. 12, 2, and 29, and 126, and 598.

CLAUS. Petersb. Acad. Bull. 9, 229; Rev. scient. 9, 181; J. pr. Chem. 25, 257; N. Br. Arch. 30, 170.

GERHARDT. N. Ann. Chim. Phys. 7, 282; J. pr. Chem. 28, 46; Ann. Pharm. 45, 34.

ROCHLEDER. Ann. Pharm. 44, 1 and 3 and 9.

Döpping. Ann. Pharm. 49, 353.

BINEAU. N. Ann. Chim. Phys. 24, 337; J. pr. Chem. 46, 296; Ann. Pharm. 78, 276; abstr. Repert, 110, 176; Pharm. Centralbl. 1849, 56; Compt. rend. 27, 184.

BERTHELOT. N. Ann. Chim. Phys. 56, 78; abstr. Compt. rend. 47, 266; Ann. Pharm. 110, 367.

Memoirs relating especially to the Modifications of Camphor.

Dessaignes & Chautard. N. J. Pharm. 13, 241; J. pr. Chem. 45, 45; abstr. Ann. Pharm. 68, 342.

CHAUTARD. Compt. rend. 37, 166; N. J. Pharm. 24, 168; J. pr. Chem. 60, 139; Pogg. 90, 622; abstr. Chem. Centralbl. 1853, 636; N. Br. Arch. 76, 168.

JEANJEAN. Compt. rend. 42, 857; further, 43, 103; Inst. 1856, 176 and 260; J. pr. Chem. 69, 204; Ann. Pharm. 101, 94; Chem. Centralbl. 1856, 575 and 672.

Camphora, Camphre, Campher; Laurus campher; Dextro-camphor, Camphre droit: Kistencampher oder chinesischer oder Formosae-campher: Tubbencampher, or Batavian, Dutch, Japanese Camphor. Oxyde de camphène (Berthelot.) Aldehyde campholique (Berthelot.) Not known to the Greeks and Romans; first introduced into Europe by the Arabians; first noticed by Actius towards the end of the fifth century; regarded by Agricola (de natura fossilis) as fossil resin; by others, as a resin or a tree-gum.

Source and Extraction. In all parts of the camphor-tree (Laurus Camphora, L.), indigenous in China and Japan. It is obtained in those countries by boiling the comminuted parts of the plants with water in kettles, which are covered with rushes or rice-straw, and with an iron helm: crude camphor then sublimes into the straw, and is converted into refined camphor (generally in Europe) by sublimation, either per se or with chalk or lime. Camphor-trees raised in hot-houses, likewise yield camphor. (Göppert, N. Br. Arch. 20, 93.)

Formation. 1. By heating borneol with moderately strong nitric acid. (Pelouze, Compt. rend. 11, 365; Ann. Pharm. 40, 326; J. Pharm. 26, 645.) An oil forms on the surface of the acid, and from this oil camphor separates on addition of water. (Pelouze.)—2. By the action of platinumblack on camphene (p. 271). (Berthelot, Compt. rend. 47, 266.)—3. By distilling oil of valerian with fuming nitric acid (Rochleder); but, according to Pierlot (N. Ann. Chim. Phys. 56, 291), camphor is not formed in this manner (see page 322).—4. When oil of sage is dropped into fuming nitric acid, a solution is formed, from which common camphor sublimes on distillation. (Rochleder.)—5. By distilling oil of tansy with bichromate of potash and sulphuric acid. (Persoz, Compt. rend. 13, 433; Vohl, N. Br. Arch. 74, 16; Pharm. Centr. 1853, 319.)—6. By the action of chlorine gas on oil of sassafras. (Faltin, Ann. Pharm. 87, 376.)—7. Common camphor is formed by distilling amber with nitric acid, and may be separated by neutralising the distillate with potash and extracting with ether. (Döpping.)—8. Macfarlane obtained common camphor by heating camphor-oil (p. 314) with nitric acid.

Sp. gr. 0.9887 (Brisson), 0.9968 (Newton); 1.00 from 0° to 0.6°, 0.998 at 6.25, 0.992 from 10° to 12.5°. (Brisson, N. Br. Arch. 48, 327.) Camphor in small lumps floats on water at 15°, has a specific gravity equal to that of water at 6.25°, and floats on it again at 11°. (Brisson) Camphor, at the temperature at which water possesses its maximum density, does not follow the same law of expansion as water, but contracts continuously as the temperature falls. (Muncke, Repert. 48, 246.)

Camphor melts at 150° (Venturi), 175° (Gay-Lussac), 142° (Thomson, Ann. Phil. 1820, 392.) It boils at 204° (Gay-Lussac), 204° (Thomson), and may be sublimed without decomposition; it volatilises in the air even at ordinary temperatures. Vapour-density = 5468 (Dumas.) Tension of the vapour at 15.5° = 0.004 met. of a column of mercury.

Rotatory power 37.4° to the right, diminishing however as the solution becomes more dilute. In solutions of camphor in acetic acid, the rotatory power varied with increased dilution from 36.2° to 30.6° to the right; in absolute alcohol, from 37.28° to 34.23° to the right. (Biot, N. Ann. Chim. Phys. 36, 257.1 Compt. rend. 35, 233; Ann. Pharm. 84, 160. The rotatory power of camphor increases with the refrangibility of the rays more than that of most other bodies. (Arntsen, N. Ann. Chim. Phys. 54, 417.) It is only camphor melted by heat, not solid crystallised camphor, that acts upon polarised light. (Descloizeaux, N. Ann. Chim. Phys. 56, 220.)

Camphor has a peculiar, aromatic, penetrating odour. The odour is disguised by addition of musk (Fleischmann, Repert. 104, 252; Pharm-Centrabl. 1850, 432); and completely destroyed by mixture with destroyed and galbanum, sagapene, animé, or tolu-balsam; partially by mixture of dragon's blood, olibanum, mastic, benzoïn, opoponax, tacamakac, quaixes or gum ammoniacum; the odour is not destroyed by admixture of jalay-

resin, gamboge, euphorbium, bdellium, amber, myrrh, scammony, sandarach, pine-resin, colophony, or China-resin. (Planche, N. Br. Arch. 22, 107.)

Camphor is not altered by exposure to light or air. Its taste is

warming, bitter, and burning.

Small lumps of camphor thrown upon water, exhibit a rotatory motion. The cause of this movement has been supposed to be: 1. An electric current between the camphor and the sides of the vessel containing the water. (Romieu, Mém. de l'Acad. 1756.) - 2. An odoriferous elastic finid, which, by surrounding the camphor, impedes the action of air and water upon it. (Prevost, Ann. Chim. 21, 255.) — 3. The attraction of camphor for air and water, and its simultaneous solution in the one and the other. — 4. The expansion of an oil, which, being given off from the camphor in the form of vapour, is attracted by the surface of the water and forms a thin layer thereon, this expansion being visible in the force with which all foreign particles floating on the water are repelled. (Ventury, Ann. Chim. 21, 262; Corradory, Ann. Chim. 37, 38.)—5. The efflux of the camphor itself into the water and into the air. (Serullas, J. Phys. 91, 172.)—6. The volatilisation of the camphor and its simultaneous solution in the nearest particles of water. (Matteucci, Ann. Chim. Phys. 53, 216.) - 7. The attraction of the water for the camphor, and the repulsive action exerted by the latter upon the water, two opposite directions of one and the same force, which acts in a curve, one extremity of whose major axis corresponds with the neighbouring bodies from which this force proceeds. (Dutrochet.)

				_		~				200	4000
											5. Dumas
0 C									77		
6 H									11.		
20	. 16	10.2	3	14	61	14.0)9]	11.8	11	48 .	11.5
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	. Liebig		& Sell.	t 8	Lauren	t.	9. Dum	as &		-	10. Claus
-							a.		ь.		
C	81.76	****	78.33	****	77.93	****	78.91	1111	79.04	1111	79.59
H	9.74		10.61	****	10.53	****	10.65	****	10.55	***	10.52
0	8.50	wie.	11.06	****	11.54	****	10.44	****	10.41	2111	9.89
	100.00	1	00.00		100.00		100.00		100.00	-	100.00
										****	200.00
		11.	Gerha	rdt.	12.	Roch	leder.		13. Vohl		
					a,		ъ.				
	C		78.3		78.84	****	79-15		81.05		
	H		10.8	****	10.40		10.37	****	10.96		
	0		10.9		10.76		10.48	****	be ma		
			100.0		100.00		100.00		100.00		-
							244.44				
					Ve	l.	Der	sity.			
		C-va	pour .		20		8.2	300			
					10		1.1				
					1			093			
	-	Cami	phor-var	pour	5	2	10.4	481			
		-		-	-			240			

¹ contains also 0.34 N; 2. Schw. 40, 356; 3. Ann. Phil. 1820, 392; 4. Phil. Trans. 1822, 11; Schw. 39, 335; 11. from borneol obtained from oil of valerian; 12, a from oil of valerian; b from oil of sage; 13, from oil of tansy.

According to Summer, complor is produced by the union of 1 at carbonic coils and 5 An oil-gas: according to Luckey's first analysis, it corresponds to the formula $C^{\mu}H^{\mu}O_{\tau}$ according to Dumas, it agrees with the formula $C^{\mu}H^{\mu}O_{\tau}$, and consists of 1 val. camplingen and χ via cappen, while Elanchet & Sell supposed it to contain a multiple of the radical $C^{\mu}H^{\mu}$, in communation with oxygen. Common camphor is related to borneol in the same manner as aldehyde to alcohol. Berthelot.)

Decompositions. 1. Camphor-vapour, passed through a red-hot glass or porceiain tube, yields a combastible gas, which explodes with 2 vols, oxygen, producing 1:45 vol. carbonic acid (Cruikshank); a volatile of containing camphor, easily soluble in alcohol; a combustible gas of sp. gr. 0:8337, 1 vol. of which absorbs by explosion 1:4554 oxygen, producing 0:955 vols, carbonic acid: no charcoal separates from the campler vapours. (Saussure.)

2. Camphor loses its odour completely when an electric current is passed through it for some time; the camphor thus deprived of smell remains inodorous for a while, even when removed from the action of the current and in contact with the ground, and recovers its odour after a longer time. (Libri, Ann. Chim. Phys. 37, 100; Schw. 53, 175.)

3. Camphor, when set on tre, burns with a smoky flame, producing carbonic acid and water. A small quantity of camphoric acid (f Gn) is formed at the same time, and charcoal remains behind. (Bouillos-Lagrange.) Spongy platinum laid on camphor begins to glow when the camphor is set on fire, continues glowing after the flame is blown out, and penetrates through the camphor, while the camphor-vapours in the neighbourhood form an arborescent crystalline sublimate. (Strating, Repert. 21, 410: Van Dyk. Repert. 21, 235.)

4. Moist chlorine converts camphor, with evolution of hydrochloric acid, into a liquid compound (hydrochlorate of camphor). (Class.) Chlorine, passed into an alcoholic solution of camphor, decomposes the alcohol, and at last slowly decomposes the camphor. (Claus.) Camphor melts in chlorine gas to a liquid, which is scarcely heavier than water, rotates to the right, gives off chlorine in the air, leaves dextro-rotatory camphor, explodes readily in sunshine, and deposits camphor. (Deville, Ann. Chim. Phys. 75, 58.) Burning camphor goes out in chlorine gas, but burns away in it with a dark red flame and deposits charcoal, if it is wrapped up in tinfoil, and the tinfoil sprinkled with powdered sulphise of antimony. (Meerten & Stratingh, Schw. 3, 442; N. Tr. 16, 300.)

6. Heated with incline, it gives off hydriodic acid gas (Colin & Gasl-

6. Heated with icdine, it gives off hydriodic acid gas (Colin & Gastthier), only after long-continued action (Guyot, J. Phys. 5, 233); compar Indicam; Nov.

 By prolonged boiling with natric acid, it is converted into capphoric acid. Bouillon-Lagrange.)

8. Camphor, heated with oil of vitrial to 100° for 12 — 13 hours is resolved into camphrene p. xiii. 176°, sulphurous acid gas, and charcel. Chautard, Coupt. rend 44 6°; J. pr. Chem 71, 310.) Heated for an hour with excess of oil of vitrial, it is converted into a volatile oil, which has the chemical properties and composition of camphor, but less rotatory power, and, when heated with potash to nearly 200°, is converted into a solid camphor, whose rotatory power is less than that of the original camphor, but greater than that of the oily camphor. (Delalande, Inst. 307, 399.) According to Gerhardt (Trate. 3, 694), the oil obtained by Delalande is probably cymene; according to Chautard, it is camphrese containing camphor. Camphor, heated with oil of vitrial forms, with evolution of sulphurous acid gas, a brown mass, from which wast

CAMPHOR. 343

separates a brown substance; on continuing the heat, sulphurous acid gas goes off, together with water, a yellow oil smelling like peppernint, and camphor, and lastly, sulphuretted hydrogen, which decomposes with the sulphurous acid; and there remains a black-brown mass, of which 49 pts. dissolve in water or in alcohol, while 51 pts. remain andissolved. (Hatchett; Chevreul, Ann. Chim. 73, 68; Gilb. 44, 164.) When camphor is heated with water and a small quantity of sulphuric acid, the escaping vapours redden litmus. (Buchner, Repert. 9, 184.)

9. Camphor, distilled with anhydrous phosphoric acid, is resolved into water and cymene. (Delalande, N. Ann. Chim. Phys. 1, 368.) Heated with concentrated hydrated phosphoric acid, it volatilises for the most part undecomposed, the acid ultimately acquiring a black-brown colour.

Buchner, Repert. 22, 420.)

10. Terchloride of phosphorus, or chlorine gas, converts camphor into quadro- or sex-chlorinated camphor, according to the quantity of the chlorine passed in. (Claus.) Distilled with penta-chloride of phosphorus, it is converted into a crystalline substance, which has the appearance and odour of mono-hydrochlorate of turpentine oil, is sparingly soluble in alcohol, yields by repeated distillation a chlorinated oil smelling like arpentine and probably containing C²⁰H¹⁵Cl, and is itself composed of C²⁰H¹⁶Cl²: it remains dissolved in the chlorophosphoric acid which passes over at the same time, is precipitated from this solution by water, and a not decomposed by alcoholic potash. (Gerhardt, Traite, 3, 694.)

C20H16O2 + PCl5 = PCl3O2 + C20H16Cl2.

Camphor dissolved in *bromine*, is decomposed by terbromide of phosshorus, with rise of temperature and evolution of hydrobromic acid, rielding only bromocamphor. (Claus.)

11. Camphor is set on fire by chlorochromic acid. (Thomson, Pogg.

11, 607; Phil. Trans. 1827.)

12. By pentachloride of antimony, at 100°, camphor is converted, with riolent intumescence and sudden evolution of hydrochloric acid, into a red-brown viscid mass. This mass, when shaken up with water, deposits powder of algaroth having a brown tint, while hydrochloric acid and a small quantity of chloride of antimony remain in solution. The alcoholic extract of the precipitated algaroth-powder leaves on evaporation a soft resin, having an agreeable odour, but not like that of camphor, and a sharp taste, producing a scratching sensation in the throat; this resin, when distilled, gives off hydrochloric acid gas and an oil, colourless at first, but afterwards becoming coloured, and having a pleasant taste, like that of peppermint, and leaves a bulky, shining charcoal. The algaroth-powder, after exhaustion with alcohol, still yields a black brown resin to other. (Claus.)

ther. (Claus.)

13. When camphor-vapour is repeatedly passed, under pressure, over heated potash-lime, camphilate of potash is produced. (Delalande, N. Ann. Chim. Phys. 1, 120; Ann. Pharm. 38, 327.) Camphor, enclosed in a sealed tube with alcoholic potash or soda, and heated in the oil-bath to 180° — 200° for 8 or 10 hours, is converted into borneol (p. 332), with

which a little camphor generally remains mixed. (Berthelot.)

14. Camphor continuously boiled with aqueous permanganate of potash reduces it, with formation of camphorate of potash. (Cloez & Guignet, Compt. rend. 46, 1110; J. pr. Chem. 75, 177.)

15. When camphor-vapour is passed through a red-hot tube filled with fragments of lime, a strongly coloured oil passes over, which has a

strong and peculiar odour, is lighter than water, boils at 75° after rectification, and dissolves in alcohol and in ether, but not in water. This is Fremy's camphrone = C**0H**0°, and contains 85.03 p. c. C, 16.25 H, and 4.72 O (calculation 85.71 p. c. C, 10.47 H, and 3.82 O). If the lime is raised to a very bright red heat, the camphrone is further resolved into carbonic oxide, carbonetted hydrogen, and naphthalin. (Fremy, Ann. Chim. Phys. 59, 16; J. pr. Chem. 5, 355; Ann. Pharm. 15, 286.)

16. When camphor-vapour is slowly passed over red-hot iron, water

16. When camphor-vapour is slowly passed over red-hot iron, water and benzene (xi, 134) are produced, or an oil isomeric therewith, which boils at 140°, has a pale yellow colour, is lighter than water, and has a peculiar aromatic odour. (Composition, see xi., 137.) At a very high temperature, naphthalin is likewise produced. (D'Arcet, Ann. Chin. Phys. 66, 110; J. pr. Chem. 13, 248; Ann. Pharm. 28, 83.)

17. Camphor, mixed with 2 pts. of alumina or clay, and distilled, is resolved into carbonic acid, carburetted hydrogen, empyreumatic oil, and a residue of charcoal. There is formed at the same time a small quantity of supports acid (3 Gm.). (Bouillon-Lagrange.)

phoric acid (? Gm.). (Bouillon-Lagrange.)

18. With melting chloride of zinc, it is resolved into water and

cymene (Gerhardt, p. 183):

$C^{20}H^{16}O^2 = 2HO + C^{20}H^{14}$.

19. Heated with corrosive sublimate, it emits an odour like turpentise and gives off hydrochloric acid gas, leaving a black-brown mass, which, when exhausted with alcohol, leaves charcoal and calomel. (Claus.)

Combinations. With Water. — Camphor dissolves in 1000 pts. of water (Giese); the solution acquires the odour and taste of campbor, becomes turbid with aqueous potash, not with aqueous ammonia or sods. — Heated with water in a Papin's digester, it dissolves more abundantly, apparently with decomposition, without separating on cooling. (Pfal, Syst. d. Mat. med.) — Its solubility in water is increased by the presence of the stronger acids, but not of carbonic acid. (Giese, Brandes.) — Is boiling water, camphor volatilises for the most part with the aqueous vapour. (Buchner, Repert, 9, 284.)

Camphor melts with phosphorus when the two are heated together, the compound subliming without taking fire or shining. — The subliming shines when rubbed, but not by the mere heat of the hand. — Phosphorus heated in camphor-vapour melts without shining. J. Davy, N. Ed. Phil J.

15, 48; Schw. 68, 384.)

Camphor may be melted with sulphur. — At medium temperature and pressure, it absorbs sulphurous acid gas abundantly, and who saturated therewith, forms a colourless liquid, which is heavier that water, gives off sulphurous acid gas on exposure to the air and leave camphor, and, on addition of water, deposits camphor, and dissolve iodine. — The quantity of sulphurous acid gas absorbed by camplest depends upon the pressure and temperature. (Bineau.)

100 pts. camphor absorb of sulphurous acid gas under a pressure of

0:70m.

at	4.00			parts.
22	8.0	***************************************	58.6	10
	10.0		54.0	16
	12.5	MANAGEMENT AND STREET,	48.9	**
	14.0		46.8	19.
	15.5		44.3	191
	20.0		37-3	**
**	24.0	THE RESIDENCE OF THE PERSONS	00/1	- 19

Camphor dissolves in 0.36 pts. of cold, or in a small quantity of warm of vitriol, forming a compound which is liquid like pitch while m, solidifies on cooling, and is soluble in alcohol (Wenzel); it dises in 4 pts. oil of vitriol at 100°, forming a dark yellow liquid autard, Compt. rend. 44, 66, J. pr. Chem. 71, 310); from the solution in fresh, the camphor may be separated by water. (Chautard.)—uphor, if well cooled, slowly unites with anhydrous sulphuric acid, ost without evolution of gas, to a soft brown mass, from which water rates the greater part of the camphor in its original state. (Bineau.) Camphor does not absorb sulphuretted hydrogen. (Bineau.)—It olves in bisulphide of carbon, forming a liquid which mixes with hol, but not with water, and is not precipitated by water. (Lamius.)

Equal parts of camphor and iodine triturated together form iodophor. (Claus.) — According to Guyot (J. Phys. 5, 233), equal parts odine and camphor do not unite at ordinary temperatures, but after e time, the mixture liquefies and gives off iodine without losing the r of camphor. — Camphor dissolves a small quantity of iodine in the , and when heated with it, melts to a dark red-brown mass which lifies on cooling and has the odour of its constituents (Winckler, ert, 32, 273); triturated with \(\frac{1}{10}\) of its weight of iodine, it forms a k-brown mass producing yellow stains. (Voget, N. Br. Arch. 155.)

Camphor dissolves abundantly and without decomposition in bromine us), forming a nearly inodorous mass which on cooling solidifies in a talline mass (Balard, Ann. Chim. Phys, 32, 377), consisting of beauly crystalline bromocamphor. (Laurent.) — The solution of camphor romine is converted by phosphorus into liquid bromide of camphor, formation of terbromide of phosphorus, evolution of hydrobromic, and great rise of temperature. (Claus.)

Camphor absorbs a small quantity of dry chlorine in sunshine, thereby iring a yellow colour in a few weeks. (Claus.) — Camphor melted 70° does not absorb chlorine, but volatilises undecomposed. (Claus.) amphor unites with hydrochloric acid gas in proportions varying rding to temperature and pressure. (Bineau.)

00 pts. of camphor absorb of hydrochloric acid gas, according to au:

at 3.0°	and under	0.738 met.	pressure		26.0 parts.
,, 3.0	,,	0.232	91	***************************************	17.0 ,,
" 7.0		0.740	**		24.0 ,,
,, 7.0	"	0.530	**	***************************************	16.3 "
,, 9.0	**	0.288	13	***************************************	15.8 ,,
,, 13.0	111	0.322	**	***** *********	15.3 ,,
,, 15.5	25	0.744	11	************************	20.5 ,,
,, 18.5	29:	0.735	**		20.4 ,,
,, 20.0	"	0.740	**		20.0 ,,
,, 24.0	39	0.747	11		19.0 ,,

camphor no longer absorbs hydrochloric acid gas :

at 12:0° and under 0:22 met. pressure.
,, 15:0 ,, 0:34 ,,
,, 20:0 ,, 0:39 ,,
,, 24:0 ,, 0:42 ,,

100 vol. camphor-vapour absorb 23.6 vol. hydrochloric acid gas. (Bineau.) Camphor at 10° and under pressure of 0.726 met. absorbed 144 vol. hydrochloric acid gas and deliquesces with it to a transparent colourless liquid (Saussure, Deville, Ann. Chim. Phys. 75, 58), having less rotatory power than camphor. (Deville.)

Camphor dissolves in 2.6 pts. of concentrated hydrochloric acid, and

precipitated from the solution by water. (Wenzel.)

Fluosilicic acid gas is not absorbed by camphor. (Bineau.)

Camphor does not absorb nitrous gas. (Bineau.) — With nitrous gas and oxygen, or with vapour of hyponitric acid, it forms a pale yellow liquid -greenish if it contains but a small quantity of nitrous acid - which when exposed to dry air, gives off red fumes till it becomes covered with a crust of camphor, — is decomposed by water into camphor and decomposition-products of hyponitric acid—mixes with alcohol and ether, giving off gas, and similarly with hyponitric acid, - dissolves 10 of iodine at ordinary temperatures, - and, when saturated at 18° contains 79 p.c. camphor and 21 p. c. hyponitric acid. - The hyponitric acid compound of camphor gives off hyponitric acid when immersed in sulphurous and gas, and the sulphurous acid compound effervesces strongly when hyponitric acid is poured upon it; in each case, a crystalline compound is produced, which soon turns yellow and gives off red vapours, deliqueses readily, and is resolved by water into camphor, sulphuric acid, nitric acid, and nitrous gas. - Camphor dissolves in cold concentrated nitric acid, forming with it a colourless or yellowish oil (nitrate of camphor-oil), which deposits camphor when mixed with water. — Camphor dissolves in 1 pt of cold fuming nitric acid. (Wenzel.) The camphor-oil which rises to the surface when 1 pt. camphor is heated with 16 pts. dilute nitric acid contains 72.3 p. c. camphor and 27.7 p. c. nitric acid. (Brandes.) The camphor-oil thus produced turns red and afterwards yellow when treated with hydrochloric acid (Bouillon-Lagrange); it scarcely dissolves and metal but mercury, because it immediately coats the metal with campber; it is miscible with alcohol. (Wenzel.)—Campbor absorbs about 1 rel ammonia-gas. (Saussure.)

Camphor is insoluble in aqueous alkalis, and does not combine with the other metallic oxides. - From an intimate mixture of camphor with carbonate of lime or carbonate of magnesia, water is said to take up three times as much camphor as it dissolves when shaken up with camphor

Camphor is but sparingly soluble in vinegar, but it dissolves in the concentrated acetic acid, forming a thickish, sharp-tasting, easily volatile, perfectly combustible liquid. (Pfaff, Syst. d. Mat. med.) — When camphor dissolves in moderately strong acetic acid, the solution is effected only by the more concentrated portion of the acid, and a watery liquid separates containing a little acetic acid and a trace of camphor. (Vanquelin, Schw. 35, 437.) — It dissolves slowly, but abundantly in cold valerianic acid; the colourless viscid solution may be distilled with at decomposition, and, when mixed with 30 pts. of water, deposits campbot (Trommsdorff.)

Camphor dissolves at 12° in 5 pt. of alcohol of sp. gr. 0-806 (Same sure.) - The colourless solution (spirit of camphor, Campheryish Spiritus vini camphoratus), has a sharp taste, and when prepared wars. deposits part of the dissolved camphor on cooling; when distilled, it give off alcohol and leaves camphor, and deposits camphor when mixed with water. - 3 pts. alcohol, which, at ordinary temperatures, dissolve 1 pt of

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corrosive sublimate, take up 2 pts. of that compound on addition of 1 pt. of camphor; 3 pts. on addition of 3 pts. camphor; 6 pts. on addition of 6 pts. camphor. (Karls, Pogg. 10, 608.) - 16 pts. alcohol of sp. gr. 0.865 dissolve 7 pts. of corrosive sublimate, and 9.6 pts. after addition of 4 pts. camphor; by agitation with finely pulverised corrosive sublimate, a solution is at length obtained, containing 25 pts. camphor and 16 pts. sublimate in 4 pts. alcohol. This solution is syrupy, has a sp. gr. of 1 326, and deposits a small quantity of calomel. When diluted with alcohol, it exhibits, with ammonia, potash, and iodide of potassium, the same reactions as corrosive sublimate. Mixed with water, it deposits camphor, and when covered with water and left to itself for a considerable time, it deposits camphor together with crystals of corrosive sublimate. When saturated with chlorine gas, it smells strongly of chloride of ethyl, and, if then left to evaporate, leaves a brown magma which deposits calomel on addition of alcohol, and whose alcoholic solution deposits brown camphor when mixed with water, yields on evaporation a brown resin containing corrosive sublimate, and turns brown when distilled, yielding a sublimate free from mercuric chloride-which smells of camphor and chloride of ethyl, and deposits camphor on addition of water-and leaving a black residue which contains calomel. (Simon, Pogg, 37, 553.)
Camphor dissolves in much less than its own weight of wood-spirit.

(Gm.) - It dissolves abundantly in acetone. (Trommsdorff.) - In 1/3

chloroform. (Smith, N. J. Pharm. 15, 441.)

Camphor dissolves abundantly in ether, and increases the solvent power of ether for corrosive sublimate. — 4 pts. of ether per se dissolve 1 pt. of corrosive sublimate; on addition of 1.33 pts. camphor, the same quantity of ether dissolves 1.33 pt.; with 4 pts. of camphor, it dissolves 2 pts.; with 8 pts. of camphor, 4 pts, and with 16 pts. of camphor, 8 pts. of corrosive sublimate. (Karls, Pogg. 10, 608.) - Camphor dissolves abundantly in compound ethers.

Camphor dissolves readily in volatile oils: from a hot solution part of the camphor crystallises on cooling. - It dissolves abundantly in benzene.

(Mansfield, Chem. Soc. Qu. J. 1, 263.)

Camphor dissolves in fixed oils and fats, and in some resins. - Heated to 112° with a few drops of almond-oil and $\frac{1}{10}$ corrosive sublimate, it deliquesces after half an hour, turning brown and giving off hydrochloric acid; the product dissolves completely in a larger quantity of almond-oil, and in alcohol with a residue of calomel. (Simon, Pogg.~37, 553.)

Appendix to Camphor.

1. Iodocamphor.

CLAUS. (1842.) J. pr. Chem. 25, 264.

Formed by triturating together equal parts of iodine and camphor. - Brown, viscid mixture, which volatilises on exposure to the air more rapidly than either of its constituents alone. When distilled, it gives off hydriodic acid gas, and yields a brown, mobile distillate having a harsh disagreeable taste like that of turpentine (and, according to Guyot, J. Phys. 5. 223. an empyreumatic odour), and consisting of camphia, a small quantity of objections in 2794, camphocrososte (side ist), constructed agreement hydrocite acid, a little undecomposed camphor, and for indice, which in the resert there remains a black campho-resis continuated with charcoal a little camphia, colophone, campho-crossts, and indice SC*H*O*-I=1 at camphia (C*H*), 3 at water, 1 at hydricia acid, 1 at camphocrosis (C*H*1, 2 at carbon, and 1 at oxygen, which is expended in the formation of camphocrososte)!—Aqueous albeits decompose inducating dec. separating the camphor in its original state.

pose indicategies: separating the campber in its original state.

Indicategies: is institute in unter, but dissolves easily, with hysinth-

nd oder, is sisted and siter. (Can.)

2. Bromide of Camphor.

LATERET. (1840.) J. pr. Chem. 20, 498. — Rev. scient. 11, 263; J.pr. Chem. 28, 253; George. rend. 10, 532. Chars. J. pr. (Sem. 23, 250.

Broncospier, Bronner de compère, Compère bronneri, expèt de complète bronneri. (Loncos.)

Francism. By dissolving complex in bromine. (Laurent.) — Who phosphicus is grainally added to a solution of camphor in bromine, oily bromise of camphor is formed and may be separated from the solution by water. (Case.)

Propagation. Campbox is dissolved in cold bromine, and the crystals which separate from the mother-liquic immediately or after a few home though not always are quickly pressed between paper, and protected from the across of light. Alarment.— The warm solution of campbox is bromine deposits amiltered campbox or cooling. (Laurent.)

Engeries. Red, right ricerite, or rectangular prisms.

CHENICA	11.0		_	.erest
5 gs				51-2
Call aCt Br.	312	 140-0		

Class considers Laurent's analysis incorrect, owing to the proneness of the broads of complex to decomposition.

Decompositions.—Receive of campbor, when exposed to the oir deliquences, gives off bromine, and leaves campbor.—When distilled, it vields bromine, campbor, a small quantity of hydrobromic acid, and a brominated oil.—In approximation it deliquences, and deposits campbor, after continued agination.

It dissolves in rotter the red solution gradually depositing camples. (Laurent.)

3. Quadrichloro-camphor. C20H12Cl4O2.

CLAUS. (1842.) J. pr. Chem. 25, 259; Rev. scient. 9, 181.

Camphre quadrichloré, Vierfach-chlorcampher.

A solution of camphor in 3 pts. terchloride of phosphorus is com-pletely saturated with chlorine; the solution which forms at first, with evolution of hydrochloric acid, is ultimately heated to 100°; the clear, pale yellow, balsam-thick product is washed with water and aqueous soda; and the hydrated chlorocamphor which then separates as a cream-like mass, is collected and freed completely from water by heating it in the water-bath, and passing a current of dry air through it. — In this manner, according to the quantity of the chlorine passed through, other chlorocamphors may be formed, containing 1—6 at. chlorine. (Claus.)

Properties. Greenish, nearly colourless, transparent, unctuous oil having at 100° the consistence of olive-oil. It has an agreeable aromatic

odour, and a bitter camphorous taste, afterwards sharp and scratching.

					Claus	
				a.		b.
20 C	120	200	41.38	 44.52		
12 H	12	****	4.13	4.54		
4 Cl				45.12		51.0
20						
C30H12Cl4O2	200		100:00	 100-00	1111	

a. not completely saturated with chlorine, or a mixture of C²⁰H¹³Cl³O² and C²⁰H¹²Cl⁴O². b. obtained by completely saturating with chlorine, a solution of camphor in terchloride of phosphorus, ultimately heated to 100°. (Claus.)

Decompositions. Heated above 100°, it gives off hydrochloric acid gas, yields a chlorinated oil, colourless at first, afterwards pale rose-red, green, and ultimately black-brown, and leaves charcoal. A wick soaked in chlorocamphor burns as long as it is held in a flame, but is extinguished when taken out. Chlorine converts it, when heated, into sexchlorocamphor. A drop of pentachloride of antimony turns it purple-red, then indigo-blue, and frequently, on addition of water, green. (Claus.)

Combinations. Quadrichloro-camphor is insoluble in water, but forms

therewith a cream-like mass; it dissolves readily in alcohol and ether.

4. Sexchloro-camphor. C20H10Cl6O2.

CLAUS. (1842.) J. pr. Chem. 25, 259; Rev. Scient. 9, 181.

Oxyde de chlocamphalose. (Laurent.)

Produced by passing chlorine gas for some time through quadrichloro-camphor heated to 100°. Colourless mass, of waxy consistence, otherwise resembling the quadrichlorinated compound.

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Laurena Laure wik Complur.

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Toporation. The ni if Harmon's Furthernium is subjected to improve the partial which mass over between 200° and into a money to make the mass. Which tries subdiffes completely, is present to the mass. Which tries subdiffes completely, is present to the mass.

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75	47	13.	 14-44		100-00

Designation in . By performed builting with mitric acid, it yields new terminations seed. Charmenly

2. Non-rotatory Camphor.

Separates from the volatile cile obtained from several plants belonging to the order Libburg. Project: The campbor which separates from oil of lavender 78:14 C. 10:47 H. and 11:39 O, according to Dumas) is destitute of rotatory power. (Biot, Compt. rend. 15, 710.)

3. Oil of Wormwood.

LEBLANC. N. Ann. Chim. Phys. 16, 333; abstr. Compt. rend. 21, 379. Zeller. Stul. über äther. Oele, Landau, 1850. Sasche. Zeitsch. Physm. 5, 14.

Wermuthül, Essence d'absinthe.

ree and Extraction. In wormwood, Artemisia absinthum, L.

The flowering plant, either fresh or dried, is distilled with water. It

yields 0.312 p. c. of oil. (Buchner, Martius.)

Properties. Dark green (Leblanc), dirty green (Martius), dark yellow brown (Zeller). It does not become colourless by repeated rectification. (Leblanc.) The green colour of the oil is due to a peculiar colouring matter; when wormwood-oil is distilled with oil of lemon and oil of cloves and water, colourless wormwood-oil passes over first, and at last green oil of cloves. (Sachse.) Sp. gr. 0.973 at 24° (Leblanc); 0.90—0.96; from the leaves, 0.92; from the flowers, 0.94. (Zeller.) Distils between 180° and 205°, and, after repeated rectification over lime, almost wholly at 205°. Rotatory power 20.67° to the right. Vapourdensity = 5.3. (Leblanc.) Has a strong penetrating odour of wormwood and a burning taste (Leblanc); its taste is peculiarly ethereal, sharp, and bitterish. (Martius.) Neutral. (Zeller.)

				Le	blanc.
20 C.,		120	 78-9	·····	78.9
16 H	ummonn	16	 10.5		10.6
20		16	 10.6		10.5
C20H1	O ²	152	 100.0	1	00.0
			Vol.		Density.
C-vapour	*************		 20		8.3200
H-gas					
					1.1093
Vapour of	Wormwo	od-oil	 2		10.5381
			1		5.7691

Decompositions. 1. The oil becomes darker and more viscid by exposure to the air. — 2. With iodine it thickens, without fulmination or rise of temperature. Old wormwood-oil, or that which has been exposed to the air, becomes heated in contact with iodine, and gives off vapours up to the point of sublimation. Fresh oil from the leaves yields a grass-green syrupy residue; older oil leaves a brown thicker residue; and oil from the flowers leaves a tough mass which solidifies. (Zeller.) — 3. The oil takes up 2·156 pts. of bromine, and acquires a darker colour. (Knop, Chem. Centr. 1854, 498.) — 4. Nitric acid decomposes it with violence, forming a non-crystalline resin. (Leblanc.) With \(\frac{1}{2}\) pt. nitric acid of sp. gr. 1·25, it assumes in a few minutes a green colour, changing to dark green and black brown. (Voget, Br. Arch. 19, 169; Zeller.) — 5. With oil of vitriol it becomes blackish (Leblanc), blue to deep violet (Zeller). — 6. When repeatedly distilled over anhydrous phosphoric acid, it gives off water, and yields volatile camphogen, C²⁰H¹⁴. (Leblanc.) — 7. With pentachloride of phosphorus it gives up its oxygen, and exchanges 1 At. H for 1 At. Cl. (Cahours, Compt. rend. 25, 725.)

$C^{20}H^{16}O^2 + PCl^5 = C^{20}H^{15}Cl + HCl + PO^2Cl^3$.

8. It is not decomposed by aqueous potash, but partially by heated potash or soda-lime, inasmuch as it blackens and partially distils over without alteration. (Leblanc)—9. Bichromate of potash and sulphuric acid immediately convert it into a dark flocculent resin. (Zeller.)—10. When boiled with nitroprusside of potassium, it yields a brown black deposit. (Heppe, N. Br. Arch. 89, 57.)

Combinations. It dissolves in all proportions of absolute alcohol, and in alcohol of sp. gr. 0.85. (Zeller.)

4. Volatile Oil of Pulegium micranthum.

Berrizmow. (1854.) Petersh. Acad. Bull. 12, 241; abstr. Phora. Centralbl. 1854, 259.

Source. In Pulcyian micronthum, a plant growing on the southen steppes of Russia, especially round Sarepta and Astrochum.

Properties. Yellowish; after rectification, calcurless or slightly yellowish, mobile. Sp. gr. 0-932 at 17°. Begins to boil at 200°, and boils with tolerable regularity at 227°. It does not salidify at —1°. Smells and tastes like the oils of peppermint and ange.

				B	علا	M.
20) C	129	_	78-54	 78-45		79-16
16 H	16		10-53	 10-63	_	10-60
20	16		10-53	 10-92	_	10-15
CallaCa	152		100-00	100-00	_	100-00

Decompositions. 1. It absorbs exygen from the air, becoming visit, specifically heavier, and brownish yellow, without giving of exclusive acid.—2. With funing nitric acid, it forms chiefly acetic acid, tegether with small quantities of propionic acid and other fatty acids.—3. With hydrochloric acid gus, it turns brown without solidifying.—4. By being with strong aqueous potash, it is converted into a brown, amorphous, aid, brittle resin, insoluble in water, soluble in alkalis and in alcohol (7746 C, 3-59 H, 13-15 O), and a volatile, altered oil, mixed with an acid liquid containing a fatty acid. When dropt into melting potash, it turns brown and decomposes partially, yielding acetic, valeric, and other fatty acids. Heated with bichromate of potash and sulphuric acid, it forms chieff acetic acid and other fatty acids. Distilled with hypochlorite of line and water, it yields chloroform.

Combinations. It dissolves readily in alcohol, ether, and oils.

5. Oil of Pennyroyal.

5. In pennyroyal, Mentha pulegium, L. The herb is distilled with water. Sp. gr. 0.9721; of the rectified oil, 0.9255. Boils between 183 and 188°.

Сэн	6O ²	152		100-00		100-00
20	**********	16	••••	10.53	********	11.36
16 H	********	16	***	10-53	*******	10-85
20 C		120	••••	78 -94		77-79
						meen,
						Kane.

Occurs generally mixed with oil of turpentine. (Kane, Lond. E. May. J. 13, 445. J. pr. Chem. 15, 160.

Camphic Acid.

C20H16O4 = C20H16,O4?

BERTHELOT. (1858.) N. Ann. Chim. Phys. 56, 94; abstr. Ann. Pharm. 112, 367.

See p. 332. Formed, together with borneol, by heating common camphor for 8 or 10 hours with alcoholic potash to 180 — 200° in sealed tubes. The contents of the tubes are exhausted with water; the undecomposed camphor and the borneol are removed by filtration; the solution, containing potash and camphate of potash, is concentrated by evaporation after neutralisation with sulphuric acid; the mother-liquor is decanted from the sulphate of potash, which separates on cooling, and evaporated to dryness; the residue is exhausted with alcohol; the alcoholic solution is evaporated over the water-bath; the residue is again exhausted with alcohol; and the camphate of potash, which remains as a syrup after the evaporation of the alcoholic solution, is decomposed by dilute sulphuric acid.

The acid forms a nearly solid resin more or less coloured. It is difficult

to obtain pure.

When heated, it yields an oil, a crystalline, not acid sublimate, and tar, leaving spongy charcoal. Heated with nitric acid, it forms a nitro-compound.

It is more or less soluble in water, and combines with bases to form

salts.

Camphate of potash is an uncrystallisable deliquescent syrup; so likewise is camphate of soda; both these salts dissolve sparingly in concentrated aqueous alkalis, and separate from the solutions on evaporation, in the form of resinous soaps, easily soluble in pure water. The camphates of zinc-oxide, lead-oxide, ferric oxide, cupric oxide, silver-oxide, and ferrous oxide are thrown down from the aqueous solution of metallic salts by aqueous camphate of soda, as precipitates which are soluble in a large quantity of water and likewise in acetic acid.

Camphic acid is readily soluble in alcohol. (Berthelot.)

Hydrochlorate of Borneol.

C20ClH17 = C20H16,HCl.

BERTHELOT. N. Ann. Chim. Phys. 56, 78.

Camphol chlorhydrique, Chlorbornafer.

Borneol is sealed up in tubes with 8 to 10 pts. of aqueous concentrated hydrochloric acid, and heated to 100° for 8 or 10 hours; and the product is washed with dilute aqueous potash, then with water, and crystallised from alcohol. In most of its properties it resembles monohydrochlorate of turpentine-oil. Rotatory power to the right, but weaker than that of borneol, different from that of mono-hydrochlorate of turpentine-oil. (Berthelot.)

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				Berthelot.
20 C	120-0	100	69-56	-
17 H	17-0	****	9.85	*******
Cl	35-5	***	20.59	20-0
C20H16, HC1	172-5	-	100-00	

Isomeric with monohydrochlorate of turpentine-oil (p. 265).

Melts and sublimes when heated, giving off a small quantity of hydrochloric acid. Ignited with quicklime, it gives off borneol, and leave chloride of calcium.

It unites at ordinary temperatures with bihydrochlorate of terpestine-oil, forming a compound which melts at the heat of the hand.

Benzoate of Borneol.

CotH12O4 = CooH10O1,CooH13O.

BERTHELOT. N. Ann. Chim. Phys. 56, 78.

Camphol benzoique, Benzbornester.

Borneol and benzoic acid are heated together to 100° in sealed take for 8 or 10 hours; the product is washed with aqueous carbonate of potash and caustic potash to remove excess of benzoic acid, and the residual mixture of borneol and benzoate of borneol is heated to 150°, till it no longer has a camphorous odour.

Colourless, inodorous, neutral oil, soluble in alcohol and other. Heated to 120° with soda-lime, it yields borneol and benzoate of sola

(Berthelot.)

¶ Appendix to Borneene. (p. 313.)

Oil of Dryabalanops Camphora.

LALLEMAND. Étude sur la composition de quelques essences. N. Ann. Chim. Phys. 57, 404; abstr. Rep. chim. pure, 2, 89; N. J. Phara. 37, 287; Ann. Pharm. 114, 193; Jahresber. d. Chem. 1859, 502.—Short notice of results, Compt. rend. 49, 357.

This oil, which was originally brought from Sumatra, by Junghala is there obtained by boiling the different parts of the tree, cut up ists small pieces, with water, and collecting the oily layer which fleats at the surface. — The oil thus produced appears to be essentially the same as that which runs out from incisions in the tree, although the properties of the latter, as described by Pelouze (p. 314), differ considerably from those assigned by Lallemand to the oil about by boiling the plant with water. Hence Lallemand concludes that the oil examined by Pelouze could not have been obtained from Dryabalanops camphora. — It is a visible reddish oil, having a strong balsamic odour, and turning the plant of polarisation of light to the right. It begins to boil at about 180°, but the boiling point quickly rises to about 255° and then to 300°, at which

temperature the whole of the volatile portion has passed over, and there remains a resin, amounting to about half the weight of the original oil.

The distilled oil is further resolved by repeated fractional distillation (mostly conducted under diminished pressure) into a more volatile and a

less volatile oil, both having the composition C20H16.

a. More volatile oil. This oil, which constitutes the smaller portion of the distillate, begins to boil at 180°, the boiling point however quickly rising to 190°. The portion which first passes over (at 180°) has a lower specific gravity (0.86 at 15°), and greater dextro-rotatory power, than that which passes over at the higher temperature (towards 190°). — The oil becomes heated by contact with oil of vitriol. — With hydrochloric acid, it forms a compound which remains liquid at all the hydrochloric acid, it forms a compound which remains liquid at all hydrochlorics. which, when treated with strong nitric acid, yields a solid hydrochlorate C²⁰H¹⁶,HCl, resembling artificial camphor (p. 265) in all its properties, excepting that it possesses dextro-rotatory instead of lævo-rotatory

b. Less volatile oil. - Somewhat viscid, sparingly soluble in alcohol of ordinary strength, somewhat more in absolute alcohol. Begins to boil at 255°, the boiling point afterwards rising to 270°, and the greater portion distilling at 260°. The specific gravity of the distillate rises with the boiling point from 0.90 to 0.921 at 20°. The distillate is at first lævorotatory, then dextro-rotatory; the dextro-rotatory power increases till the boiling point rises to 260°, then diminishes, and the portion which distils at 270° is optically inactive.

The oil b gives by analysis 88.74 p. c. C and 11.76 H, agreeing nearly with the formula C²⁰H¹⁶. — It becomes heated by contact with oil

of vitriol.

Hydrochlorate of Oil b. C30H24,2HCl. - The oil unites with hydrochloric acid, becoming heated at the same time, and forms a compound which is liquid at first, but solidifies partially after some days, and when recrystallised from ether-alcohol, forms colourless four-sided prisms. It turns the plane of polarisation to the left, whether prepared from lavoor dextro-rotatory or optically inactive oil. Melts at 125°.

					La	llema	nd.
30 C	26	****	64·98 9·38 25·64	*******	64·80 9·45 25·55		64·66 9·59 25·92
C30H24,2HCl	277	****	100.00	******	99.80	said	100-17

It decomposes at 175°, giving off hydrochloric acid. It is decomposed by oxide of lead or mercuric oxide at 100°, more readily by alcoholic potash-ley, with separation of the hydrocarbon (which then exhibits a sp. gr. of 0-90 at 25°, possesses levo-rotatory power, boils at 260°, and unites with hydrochloric acid, reproducing the original compound).

The hydrochlorate is sparingly soluble in ether, moderately soluble in

alcohol.

c. Resin. CooH46O4? - The resin left in he first distillation of the oil of Dryabalanops Camphora is a neutral, dark red, brittle substance, which softens at 100°, and melts at a somewhat higher temperature. It turns the plane of polarisation strongly to the right. It is somewhat soluble in alcohol, more readily in ether. By solution in absolute alcohol, it may be rendered colourless, but cannot be obtained in the crystalline state. It is neutral, and does not unite with bases. It gave by analysis 81.32 p. c. C and 11.03 H, the formula requiring 82.19 C, 10.50 H and 7.31 O. Lallemand supposes

it to be formed from the hydrocarbon $C^{2r}H^{24}$, by assumption of 6 At. oxygen and elimination of 2 Az. water $C^{2r}H^{4r}O^4=2\,C^{2r}H^{24}+O^6=2\,HO)$.

The oil of D:yabalanops Camphora examined by Lallemand did not contain horners.

Vilatile of Laurus Camphora. — Mobile, nearly colourless, having a strong odear of common camphor and considerable dextro-rotatory power. By fractional distillation it is resolved into an oil boiling at 180°, and a portion boiling at 205°; the latter appears to be essentially the same as common camphor. — The oil boiling at 180° is very much like oil of lemons, possesses strong dextro-rotatory power, and forms with hydrochloric acid, a crystalline compound which melts at 42°, and gives by analysis, 57°34 p. c. C, 8°6 H and 33°83° Cl, agreeing with the formula CWH*,2HCl calculation 57°42° C, 8°61° H, 33°97° Cl).¶

Appendix to the Primary Nucleus CoH.

Volutile Vills, not yet included in the System, together with the Camphon or Searceptenes which separate from them.

(Arranged alphabetically.)

1. Oil of Acacia.

The ethereal extract of the flowers of Acicia alba, L, leaves by spontaneous evaporation, a yellow, warty mass, which sticks to the finger, and has a strong and persistent smell of acacia: it appears to be a product of the decomposition of the cil.—This mass yields by distillation mempyreumatic oil having an unpleasant odour; it is soluble is boiling alcohol, the solution on cooling depositing flocks which exhibit the characters of wax. Favor, 1838, J. Chim. méd. 14, 212.)

2. Volatile Oil. (Acrite de amacéy.)

In the branches of an unknown tree growing in the neighbourhood of Bogota. It exudes spontaneously when the branches are cut, and so plentifully that a litre of oil may be obtained in a few minutes.—Yellowish, mobile, not solidifying at a few degrees below 0°.—Smell like oil of neroli, or rather like oil of rose and essence de cicari; its tasse is sweet at first, afterwards sharp and bitter. It is used in Bogota for adulterating balsam of copaiba. (Leroy, 1846, N. J. Pharm. 9, 107.)

3. Volatile Oil of Acorns.

Obtained by distilling bruised acorns, the fruit of Quercus robur and Q. pedunculata (Willd.), after maceration with water. — Buttery, lighter than water; has a strong peculiar odour. Appears to consist of an oil soluble in ether, and another oil soluble in alcohol of sp. gr. 0.85. (Bley, N. Br. Arch. 2, 124.)

4. Alyxia-camphor.

Separates from the inner surface of the bark of Alyxia Reinwardii, (Blume), a tree growing in Java and Amboyna.—White, neutral, capillary crystals, having an agreeable odour of Tonka beans and a slightly aromatic taste.—Sublimes without melting when heated to 75°—87°; melts and turns brown at a stronger heat. Distils partially with vapour of water.—Nitric acid of sp. gr. 1·2, colours it yellow without dissolving it.—Dissolves very sparingly in cold, more easily in warm water, and does not separate from the solution on cooling.—Dissolves readily in aqueous potash, carbonate of potash, ammonia, &c., without neutralising them; also readily in acetic acid, alcohol of sp. gr. 0·85, ether, and oil of turpentine. (Nees v. Esenbeck, Br. Arch. 28, 1.)

5. Oil of Angelica.

By exhausting with alcohol the comminuted roots of Angelica sativa, M., concentrating the solution, precipitating with water, and distilling the separated balsam with hydrate of potash, a colourless oil is obtained, lighter than water, of penetrating odour and camphorous taste.— The same oil is obtained by distilling the comminuted roots with water, and rectifying the resulting oil over hydrate of potash, angelate of potash then remaining behind.— The oil obtained by either of these processes becomes coloured, and resinises on exposure to the air. (A. Buchner, Repert. 76, 161.)—Bucholz & Brandes (N. Tr. 1, 2, 128) obtained by distillation, 0.7 p. c. of oil; John (Chem. Tab. 4, 17), obtained 0.6 per cent.

6. Oil of Angustura.

Angustura-bark, the bark of Galipea officinalis, Hanc, yields by distillation with water, 0.75 p. c. of oil.—Light wine-yellow. Sp. gr. 0.934.—Boiling point 266°.—It cannot be rectified with water or solution of common salt.—Has a peculiar aromatic odour, and a mild taste with scratching after-taste. Contains 79.60 p. c. C, 12.31 H, and and 8.09 O, and is therefore perhaps C¹³H¹²O = C³H⁴ + C³H⁶O, that is to say, a mixture of oxygenated and non-oxygenated oil. (Herzog, N. Br. Arch. 93, 146.) It is not apparently attacked by melting hydrate of potash.— Does not combine with alkaline bisulphites. (Kraut.)

7. Oil of Anima

In result the resin of the locust-tree, Hymenese Courbert, L.—
The results installed for m. Coloraless oil, with a strong not unpleased that a larger mass. Volatilises without residue; is colored been transportative in the formula dissolves without turbidity is dissolved. Thin, I type form. 15, 326.)

S. Oil of Ants.

in the tool and I where took L. (compare vii. 271) — The ages an assumed with water to absolute the distillate repeatedly coholute. Mangarai Nine and the in which deats on the surface, collected — The inices years it is a c. of al Nolle), I p. c. (Hermbeledt.)-Transparent and economiest with an agreeable edour (Nölle); in take nine in the parties of the Solveton, 1, 342); sparingly soluble is nine an already. Acquire: Nine, J. Br. Arch 31, 188.)

2. Of of Arnica.

Therein - L Is the fivers of Armos montana, L. - Obtained by Essellation was water - Blue Hever, Crist chem. J. 3, 100), yeller to become at green, with a permiss oders, Zeilers, like that of chancelle Here reares surface and Letter - In contact with indian ! become aging rease realist relies hown and viscid. With a and a secret a howard very near and if heated gives off a last quantity of the and forms a sold result. — With oil of ritriol, it assumes a versult to measure brives of the selection. — It dissolves in 100 pts. of alcohole set of 1886 become not train a and freedom to with 10—60 pts. of absolute of the control of the contr

The roots of American Monorary. I., whence it is obtained by does not wise to a more more than the brownish vellow. Sp. gr. Cos. 100 Names a grant at 2 Zeller. — It dissolves inline, with our two contracts of evolution of gas, becoming red-brown and two at William Contract of the tree little gas, becoming red-brown and two at William Contract of the tree little gas, becoming red-brown and two at William Contract of the tree little gas, assumes a grant grown of the little becomes vised. — William Contract of the little becomes vised. — William Contract of the little becomes vised. — William Contract of the little becomes vised. on and the latter like it elected alcohol. (Zeller, State alcohol. (Zeller, State alcohol.)

10. Oil of Asarum.

GRÄGER. (1830.) Diss. inaug. de asara europ. Göttingen, 1830. ZELLER. Br. Arch. 36, 266. - Stud. über äther. Oele, Landau, 1850. SELL & BLANCHET. Ann. Pharm. 6, 296.

In asarabacca, the root of Asarum europæum, L. — It is exhausted with alcohol, the lower stratum of the extract, consisting of the oil and asarum camphor, is separated from the upper, and distilled; the residual, oily, thick mass is rectified over hydrate of lime; and the oil is decanted from the asarum-camphor which separates at the same time, and dehy-drated over chloride of calcium. (Sell & Blanchet.)

Properties. Yellowish (Gräger), greenish yellow (Zeller), viseid, lighter than water. (Gräger.) Sp. gr. 1.018. (Zeller.) Smells like valerian, and has a sharp burning taste. (Gräger.) It is neutral. (Zeller.) Contains 75.41 p. c. C, 9.76 H, and 14.83 O, but still retains

Asarum-camphor in solution. (Sell & Blanchet.)

Asarum-oil, treated with iodine, gives off yellowish red vapours, and forms a yellow-brown resin. Heated with nitric acid, it gives off gas, and forms a yellow-brown solid resin. - By oil of vitriol, it is coloured brown to blood-red and resinised. (Zeller.) — It dissolves sparingly in water, more readily in alcohol, in ether, and in oils both fixed and volatile. (Gräger.)

11. Oil of Balm.

ZELLER. Stud. über äther. Oele, Landau, 1850.

In the herb of Melissa officinalis, L. at the flowering time, -Obtained by distilling the herb with water.—Colourless, pale yellow. Sp. gr. 0.85—0.82. Has a peculiar odour. Reddens litmus slightly.—According to Bizio (Brugn. Giorn. 19, 360), it contains a comphor in solution.—It dissolves iodine, with great rise of temperature and evolution of yellowish-red and grey vapours, and becomes viscid. With nitric acid, it turns brown, gives off a large quantity of gas when heated, and becomes resinised.—It dissolves in 5 to 6 pts. alcohol of sp. gr. 0.856.

12. Basil-camphor.

C20H22O6 = C20H16,6HO?

BONASTRE. (1831.) J. Pharm. 17, 647. Dumas & Peligot. Ann. Chim. Phys. 57, 334; J. pr. Chem. 4, 386; Ann. Pharm. 14, 75.

Basilicum-camphor, Essence de basilic.

Basil, Ocymum basilicum, L., distilled with water, yields about 1.56 per cent. of a yellowish green oil, lighter than water (Raybaud, J. Pharm. 20, 447), which when kept, solidifies almost wholly as crystalline bail-

camphor. (Bonastre.)

Solid oil. Crystallised from alcohol: four-sided prisms having a faint smell and taste; crystallised from water, it forms white, transparent nearly tasteless tetrahedrons. (Bonastre.) Neutral.

			1	Dumas .	& Peligo	t.
The second second	120	_				
	22					
The second second		_			_	-
C20H16,6H	O 190	THE R	100-00	-	100-0	

Isomeric or identical with crystallised turpentine-camphor (p. 262, Dunas & Peligot.)

It burns with odour and flame when set on fire; reddens in contact

with oil of vitriol. (Bonastre.)

Dissolves sparingly in cold, easily in hot water, in nitric acid, outif acid, and aqueous ammonia, imperfectly in cold, perfectly in hot alouds, scarcely at all in 6 pts. of ether. (Bonastre.)

13. Oil of Bay.

Bonastre. (1824.) J. Pharm. 10, 36;—11, 3. Brandes. N. Br. Arch. 22, 160.

Oil of Laurel, Lorbeerol.

Source and Extraction. In bay-berries, the fruit of Laurus nobilis, whence it is obtained by distillation with water, or by arranging the

whence it is obtained by distillation with water, or by arranging the berries in alternate layers with straw, and distilling with steam. (Force, N. Br. Arch. 17, 177.) Or it is distilled with water and a little sulphuric acid, the latter serving to decompose starch and maca. (Bonastre.) The yield of oil is 0.26 p. c. (Bley, Repert. 48, 96.)

Properties. Pale yellow (Bonastre, Brandes); the most volatile portion, or the oil rectified with water, is transparent and colourless, while the less volatile is yellowish. Lighter than water. (Bonastre.) Sp. gr. 0.914 at 150°; of the most volatile oil 0.857; of the less volatile. 0.885 (Brandes). Liquid at 31°, semi-solid at 12.5°; at low temperatures perfectly solid and dirty white. Smells like bay-berries; the most volatile portion, like oil of cajeput; the less volatile has a similar odott but less pure, and, after rectification with water, also like that of camphor (Brandes); the oil obtained by distilling bay-berries with in-phuric acid and water, has a less agreeable and empyreumatic odour. (Bonastre.) Tastes strong and bitter. (Bonastre.) It is neutral (the crude oil is slightly acid). (Bonastre.)

		Brandes.									
	a.		ь.		c.		d.		4.		
C	80.60		80-55		80-56	****	78.85	****	82-14		
Н	11.76	nn		****	9.30	****	11.14	****	11:54		
0	7-64	****	8:19	414	10-14	****	10-01	****	6.33		
11/4/	100:00	14	100.00	Tour.	100.00	Charge	100.00	-	100-00		

a was obtained by rectifying the crude oil per se in the first instance; b that which passed over on rectifying the crude oil with water; c a portion boiling at a higher temperature; d that which has the highest boiling point; e obtained by rectifying the crude oil with concentrated aqueous potash. The latter has the composition of crude oil of camphor. (Brandes.)

Decompositions. 1. Bay-oil absorbs oxygen from the air (Brandes).

— 2. With 2 pts. of fuming nitric acid it froths up, and forms a soft yellow resin, which separates on addition of water. (Hasse, Crell. Ann. 1785, 1, 422.)—3. When agitated with potash, it forms after some time an oil, which floats on the surface, and a brown liquid, which, after saturation with hydrochloric acid, yields a white precipitate soluble in ammonia. Distilled with aqueous potash, it yields a neutral oil (e), having an odour of camphor and cajeput-oil, but not very pungent.

(Brandes.)

Combinations. Mixed with ammonia, it yields a turbid liquid, and with caustic baryta a white viscid liquid. (Brandes.) It is easily soluble in alcohol. The least volatile portion of the oil dissolves but partially in alcohol, aqueous potash, and ammonia, leaving a brown oil, while the alcoholic solution contains a crystalline substance; the potash-solution, a substance which separates on supersaturating with hydrochloric acid, and is soluble in potash and in ammonia; and the ammoniacal solution contains a substance which forms a white precipitate with chloride of calcium.

Bay-oil dissolves readily in ether and in oils, both fixed and volatile;

with the aid of heat, it dissolves tallow and wax. (Brandes.)

14. Volatile Oil of Beans.

Formed spontaneously in pulverised dry beans, *Phaseolus communis*:

1. On moistening the powder with water.—2. On evaporating the alcoholic extract and mixing the residue with almond milk. Bean-flour, exhausted with alcohol, does not form any oil when moistened with water. (Ed. Simon, 1842, N. Br. Arch. 29, 186.)

15. Oil of Birch-leaves.

In the leaves of the birch, Betula alba, L. By distilling them with water, 0.36 p. c. of oil is obtained, floating on a milky distillate. Colourless, mobile; the last distillate is yellowish and viscid, lighter than water; becomes somewhat turbid and viscid at 0°, retains scarcely any fluidity at -5°; solidifies at -10°, but not in the crystalline form; melts at the heat of the hand. Its odour is very agreeably balsamic, persistent and exciting, like that of young birch leaves and oil of roses. Its taste is at first mildly sweetish, afterwards peculiarly balsamic, sharp, and heating. The oil becomes pale yellow after some time, and when dropped upon paper makes a waxy spot, which may be extracted by boiling water, forming a solution which deposits white flocks on cooling. The oil appears to contain a waxy substance in solution (Betulin, Gm.).

In description of the electric of the graph with at 12.5°, forming a clear liquid, which becomes turbed at \$\psi\$: it dissolves slowly in other, separating our saver in \$\text{P}\$ — Grassmann, Report, 33, 337.)

16. Vistile Oil of Botany Bay Resin.

Obtained by distilling the ratio of Landovran arbora (R. Bron) with f yes where Orientees: has an agreeable edour and very sleep aromatic mass. Transmissions. Institute 1826, 9.)

17. Camples of Funktionen mortimen.

In the fewers of Presidentees werkeness, a plant growing on the shores of Present. The fewers, which have an agreeable odour of ross, are instilled with water; the instillate is coholated, and the crystal which separate from it an about of are collected. Yellow, pointed crystals, taying a siky lastre, and meeting at the heat of the head to a print with the instrument at agreeable but not powerful odour. Redden from a singlety. So they is already; the solution is rendered turbid by water.

Landerer, Report 75, 283.

18. Oil of Cardamom.

In surfamous the seel of Hamph Cardiamouras. (Whit. & Mat.) They are included with water. The water Revise contains acetic acid. (Wandar, Disc. From it. 400. That yellow. Naturaln. Zeiler.) Sp. gr. 1-92—0-94. Tastes and smalls have the seeds. Neutral. (Zeiler.) Probably a matter of a victor and a seed of imagewish as Dumas & Peligot Ann. Of m. 1-1/4. The Seed of the Contain 4.886: Ann. Pharm. 14, 75) first in the containest tests. which according to them contain 649 for Collect. He and their are somewhering agreeing with the formula Cultivation of mattern in treated with addiest, gives off yellowished and grey visitories and becomes reduct with addiest, gives off yellowished and grey visitors. And becomes reduct with addiest, gives off yellowished and grey visitors. And becomes reductive become and visited. With the contain the collect with addiest, gives off yellow said so that the collect with chromate of potast and so, the collect of green selection. The er. In dissolves in alcohol of any green selection. The Landan, 1850.)

19. Oil of Carrot.

From the note of France France. L. They are cut up while first and distributed in with water, whereby 0.0114 p. c. of oil is obtained. Color-less. Sp. gr. 0.8880 at 11.2. Has a peculiar strongly penetrating ador, and a taste of similar character but at the same time warming and successful unpleasant. It dissolves sparingly in water, readily in alcohol and her. (Wackentoder, Mag. Phrem. 33, 145.)

20. Oil of Cascarilla.

TROMMSDORFF. (1833.) N. Tr. 2, 136. Völkel. Ann. Pharm. 35, 306; Repert, 80, 169.

In cascarilla bark, the bark of Croton Elateria (Schw.) It is comminuted and distilled with water. The quantity of oil obtained amounts to 0.35 p. c. (Bley, Repert. 48, 97), to 0.87 p. c. (Trommsdorff.)

Properties. Dark yellow (Trommsdorff, Völkel) (sometimes of various shades from blue to yellow, or greenish: Trommsdorff): the first distillate is colourless, mobile, and refractive; the later portions yellowish and more viscid; the last very thick. (Völkel.) Sp. gr. 0.938 (Trommsdorff); 0.909; of the first distillate, 0.862. (Völkel.) Boiling point 180° and higher; of the first distillate 173°. Smells aromatic, like camphor, thyme, and lemons (Trommsdorff); its odour is aromatic, like camphor, thyme, and lemons (Trommsdorff); its odour is agreeable; that of the last distillate less agreeable. (Völkel.) Taste aromatic, rather bitter. (Trommsdorff.)

	a.	B.
	1976	U.
C	4.69	80.90
H	0.49	10-27
0	4.82	8.83

e The first distillate obtained on rectifying with water; b the last distillate. crude oil is a mixture of at least two oils, the most volatile of which is probably free from oxygen. (Völkel.)

Decompositions and Combinations. The oil is decomposed by the stronger acids, but not by alkalis. (Völkel.) With fuming nitric acid, it yields a yellow fragrant resin, without taking fire. (Trommsdorff.) Dissolves readily in alcohol; the solution reddens litmus. (Tromms-

dorff.)

21. Oil of Convolvulus scoparius.

Rosenholzöl. In the wood of the root and stem of the plant. Pale yellow, mobile, lighter than water, with an odour of roses, cubebs, and balsam of copaiba, somewhat viscid, and a bitter aromatic taste. It becomes reddish after some time. It absorbs iodine vapours in a few hours, and becomes brown and black. With \(\frac{1}{4}\) pt. nitric acid, it acquires a pale brown colour, without losing its odour. (Bonastre.) In nitrous acid vapours it acquires a dark yellow colour. Mixed with an equal number of drops of oil of vitriol, it forms a brown mixture, having an odour of cubebs. (Guibourt, N. J. Pharm. 15, 347.)

M. In it Colleges.

These is the first of the same of the same

II. Of it Castarena.

Durant we destine assessme when with water, and containly pouring many me distillant. John in the extinacting with cold other, which many me extract me distillant me resolve repeatedly with water, as only as of masses over francis. V. Br. Arch. 1, 183).—Pale years from francis. V. Br. Arch. 1, 183).—Pale years from francis. There is a strong solver of castoreom (Boha, Brancis and a small himse a strong solver of castoreom (Boha, Brancis and me value there is no partially construct and me value francis in the value leaves resin when distilled, a strong of the strong of t

24 Camplin of Cat-thyme.

And will represent the — It all parts of earthyme, Tenerium Marun, L. — The lire from is itself-of with water, and the distillate repeatedly collidated lives from parameters of the green herb. — White, crystalline, transparent from mass, it resisting of thin famines, and sinking in water. Has an impleasant officer and are made taste. (Bley, 1827, N. Tr. 14, 2, 87)

25. Oil of Celery.

Sellercicil. — In the see is Tietzmann), the herb (Vogel) of celery, Apium generalens, L. — It is chained by distillation with water.— Transparent and colourless Vogel, pale yellow (Tietzmann), lighter than water (Vogel, of sp. gr. 0081; has a pungent, sweetish heating odour. Dissolves sparingly in water, readily in alcohol and ether. (Vogel, Schw. 37, 365; Tietzmann, Tuschenbuch, 1821, 45.)

26. Oil of Wild Chamomile.

Zeller. (1827.) Repert, 25, 467. - Stud. über äther. Oele, Landau, 1850.

STEER. Repert, 61, 85.

Borntrager. Ann. Pharm. 49, 244; abstr. Repert, 90, 215.

Kamillenöl, Essence de camomille bleue.

Source and Extraction. In the flowers of wild chamomile, Matricaria Chamomilla, L .- The herb recently dried is distilled with water or with steam. - Tin receivers are used for collecting the distillate, because all the oil then collects on the surface of the water which passes over with it, whereas in glass receivers, a portion of the oil adheres obstinately to the sides of the vessel. — Distillation with steam is preferable to distillation with water, because it obviates the risk of burning the chamomile-flowers, which swell up considerably; the steam must however be passed through without interruption, to prevent the chamomiles from adhering in lumps, which would interfere with the passage of the vapour. (Steer.) — The water which passes over contains a colourless oil, having a different odour from the oil which floats on the surface; this oil may be extracted from the water by agitation with ether, and it remains behind after the evaporation of the ether. (Bornträger.) The water which passes over with the oil contains acetic acid. (Hautz, J. pr. Chem. 62, 317.)

The yield of chamomile-oil is less as the flowers are older; dry chamomiles yield

0113 p. c., (Gumprecht, Br. Arch. 7, 108); chamomiles four years old yield in four distillations 0.04 p. c.; recently dried chamomiles yield by two distillations with steam the distillate being collected in tin vessels, 0.416 p. c. of oil. (Steer.)

Properties. Dark blue, azure-blue, nearly opaque; perfectly fluid at 12°, viscid at 5° (Zeller); of the consistence of honey at -4°, solid at -6° (Bizio, Brugn. Giorn. 19, 360); solid from -10° to -12°; melting again at -5° . (Zeller.) According to Bornträger, it merely becomes thick below 0° , but does not solidify. — Sp. gr. 0.92 - 0.94. — Has a strong odour of chamomile, and an aromatic warming taste. (Zeller.)

	Bornträger.							
amendment have be	a.	42 100	b.	E PER	c.			
C	79.83		79.56		78-26			
H	10.64	********	10.83		6.0			
0	9.53		9.61		m. 1			
THE PERSON	100.00	********	100.00	100	98			

a, crude oil; b rectified; c the last distillate. Its composition is nearly the same as that of common camphor. (Gerhardt, Traité, 4, 353.)

Decompositions. 1. When exposed to air and light, it assumes various shades of colour from green to brown, and finally becomes greasy. The fresher the chamomiles used in the preparation, the longer does the oil retain its colour on exposure to air and light. (Zeller.) -2. When distilled, it leaves a small quantity of brown resin; distilled with water, it passes over blue from first to last, while the water which goes over at the same time is colourless. (Bornträger.) - 3. With iodine, it becomes

heated without detonating; gives off a few yellowish red vapours becomes greenish to yellowish brown, viscid, and at last solid and friable. (Zeller.) — 4. With fuming nitric acid it assumes a dark brown colour, and then yields with water a yellow-brown resin smelling like musk (Hasse, Crell. Ann. 1785, 1, 422); with nitric acid of sp. gr. 1'28 it turns green, then dark red-brown, gives off gas with violence when heated, and leaves a brittle, friable resin. (Zeller.) — 5. With oil of vitriol, it assumes a dark red-brown colour, and forms a soft resin (Zeller); on adding water to the mixture it takes fire with available. adding water to the mixture, it takes fire with explosion. (Hasse, Crell. Ann. 1786, 2, 36.) — 6. With bichromate of potash and sulphuric acid, it becomes yellow-brown and thickens. (Zeller.) It dissolves in 8 to 10 pts. of alcohol of sp. gr. 08.5 easily and with blue colour in ether. (Zeller.)

27. Oil of Chenopodium Ambrosioides.

M. MARTINI. (1737.) Diss. de Chenop. ambrosioïd. BLEY. N. Tr. 2, 32. — Repert. 48, 96. BECKER & HIRZEL. Pharm. Zeitschr. 1854, 8.

Mexicanisches Traubenkrautol.

Source and Extraction. In Chenopodium ambrosioides, L., a plant growing in Mexico. The plant, distilled with water, yields 0.31 p.c. oil (Martini), 0 319 p.c. (Bley), 0.78 — 1.17 (Becker.)

Properties. Pale yellow or pale greenish yellow (Bley); transparent and colourless after rectification (Hirzel); very mobile (Bley); strongly refractive after rectification (Hirzel). Sp. gr. of the rectified oil, 0.902; boiling point 179°—181°. (Hirzel.) When floating on water at low temperatures, it solidifies with the consistence of tallow or wax. (Martini.) Has a strong odour like that of the plant (Becker), and at the same time like that of onions. (Bley.) Tastes stongly aromatic, somewhat bitter and burning (Bley); cooling like oil of peppermint (Beckel.)

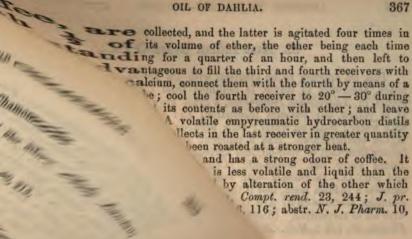
Decompositions. 1. The oil easily takes fire (Hirzel), and burns with a very smoky flame. (Bley, Hirzel.) It is violently attacked by fuming nitric acid.—3. With oil of vitriol it turns red and resinises. (Bley.)

Combinations. With aqueous ammonia it forms a permanent

It dissolves sparingly in water, easily in alcohol, ether, and oils both fixed and volatile (Bley); in 3 pts. of alcohol and in 30 pts. of water. (Becker.)

28. Oil of Coffee.

Occurs in roasted coffee. To obtain it, coffee roasted at a gentle heat is covered with 10 pts. of water, and left to stand for two hours, and the whole is then distilled from a retort, which is connected with four receivers joined together by tubes; the contents of the third receiver, which consists of solid inodorous oil and a watery distillate smelling



of Curcuma.

Curcuma longa, L. The comminuted root is distilled and the distillate is cohobated several times. Lemon-yellow, with a penetrating odour and burning taste. (Vogel & Pelletier, .815; J. Pharm. 1, 291.)

30. Oil of Curcuma Zerubet.

Zitterwurzöl. — In the tubers of Curcuma Zerubet (Roxbourgh), from which it is extracted by distillation with water. Pale yellow, turbid, viscid, heavier than water; has a peculiar, strongly camphorous odour, and a rather bitter, fiery, camphorous taste. (Buckholy, 1817; Alman, 1817, 45.)

31. Oil of Dahlia.

In the roots of several species of Dahlia. They are bruised to a pulp and distilled with water. The oil is lighter than water, has a strong odour like the roots, and a sweetish taste, with slightly acrid aftertaste in the throat. It changes after a while into a reddish resin insoluble in alcohol. In water, it gradually sinks to the bottom, becomes buttery and indistinctly crystalline; melts when heated, and forms on cooling long prisms of benzoic acid, whilst the oil separated therefrom does not crystallise. It forms with water a permanently turbid emulsion, which rups through the filter. It dissolves in alcohol, and is left with amber-yellow colour when the alcohol evaporates. (Payen, 1824, J. Pharm. 9, 384; 10, 239; abstr. Repert. 20, 337.)

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Oil of coffee is orange-yellow, and has a strong odour of coffee. It consists of two oils, one of which is less volatile and liquid than the other, and appears to be produced by alteration of the other which possesses the fragrant odour. (Payen, Compt. rend. 23, 244; J. pr. Chem. 38, 478; N. Ann. Chim. Phys. 26, 116; abstr. N. J. Pharm. 10,

270.)

29, Oil of Curcuma.

In the root of Curcuma longa, L. The comminuted root is distilled with water, and the distillate is cohobated several times. Lemon-yellow, mobile, with a penetrating odour and burning taste. (Vogel & Pelletier, 1815; J. Pharm. 1, 291.)

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32. East Indian Grass Oil.

This oil appears to be identical with Oil from Namur, though the latter, according to Royle, is obtained from Calamus aromaticus. It occurs in Andropogon Ivarancusa, a grass growing in the East Indies. It is yellow, but becomes transparent and colourless after distillation with water; floats on water; boils between 147° and 160°, or partly at higher temperatures. Has a pungent aromatic odour, similar to, but fainter than that of rose-oil, less agreeable after distillation with water. Tastes sharp like lemon-oil. Contains 83·51 p. c. C, 11·46 H, and 5·03 O. In contact with sodium, it quickly gives off hydrogen, deposits a reddish resin, and if then distilled, yields an oil which quickly resinises, contains 88·37 p. c. C, and 11·56 H, and is therefore isomere with oil of turpentine. (Stenhouse, 1844, Phil. Mag. J. 25, 201; Ama Pharm. 50, 157; Mem. Chem. Soc. 2, 122; Chem. Gaz. 1844, 294.)

33. Oil of Elder-flowers.

Fliederblüthenöl, Hollunberblüthenöl. - In the flowers of the elder, Sanbucus nigra. The dried flowers are distilled with water, and the distillate is several times redistilled over fresh quantities of the flowers; or very concentrated elder-water is agitated with ether and the ether left to evaporate. The flowers yield scarcely 0.32 p.c. of oil. (Pagesstecher.) Buttery (Lewis) ; crystalline and of waxy consistence, greenishwhite (Eliason), light yellow, mobile, floats on water, smells strong of the flowers (Pagenstecher); has a rather bitter burning taste, and cooling after taste. (Eliason, Pagenstecher.) The oil becomes dark brown and viscid when exposed to the air.—Chlorine gas, passed into elder-water, at first produces thick fumes, and afterwards imparts a dark yellow colour to the drops of oil which float on the water, and fimile sink to the bottom, whilst the water acquires a strong odour radish, contains but little hydrochloric acid after saturation, and, when evaporated at a gentle heat, leaves a chlorinated oil having a share biting taste, mixed with crystals. Bromine acts like chlorine, yielding a brown brominated oil, which sinks in water. - Elder-water mixed with hydrochloric acid, yields a small quantity of sal-ammoniac who evaporated; the ammonia which it contains results from the decomposition of a constituent of the flowers; the oil is free from ammonia (Pagenstecher, Repert. 73, 35.)—The oil dissolves in absolute alcohol. and ether, sparingly in alcohol of sp. gr. 0.85, in oil of rosemary and in water; the aqueous solution is neutral. (Eliason, N. Tr. 9, 1, 246) Fr. Müller (N. Br. Arch. 45, 153), by distilling recently dried elder flowers with water, obtained a yellow water, which, when treated with alkalis, became darker in colour, gradually deposited yellowish nucrystalline flocks, which when dissolved in ether, coloured it yellow. and remained when the ether was evaporated in the form of yellowish transparent scales, soluble with yellow colour in carbonate of potats, and precipitated by acetic acid.

34. Oil of Feverfew.

Obtained by distilling common feverfew, Pyrethrum Parthenium while in the flowering state, with water. Greenish; passes over between 165° and 220°; the largest portion between 205° and 220°, leaving a coloured residue. Deposits camphor on standing, this deposit being formed most abundantly in the oil which passes over between 212° and 220°, on cooling. Oil prepared in 1845, did not yield any camphor on standing.

Dessaignes & Chautard.

	a.	ь.		c.		d.	e.	f.
C	77.60	 77.96	122.00	76.92	1000	77.02	 85.77	 86.46
H								
	87.97	 88.56		87-29	-	87.26	 96-99	 98:04

a, Oil separated from the deposited camphor; b, oil containing only a small quantity of camphor; c, oil boiling at 216° — 220°; d, at 212° — 216°; e, at 170° — 180°; f, at 160° — 167°, repeatedly rectified over potash. The oil contains camphor, a hydrocarbon, and an oil richer in oxygen than camphor. (Dessaignes & Chautard, N. J. Pharm, 13, 251; J. pr. Chem. 45, 45.) — The camphor contained in oil of fever-few is levo-camphor. (Chautard, Compt. rend. 37, 166.)

35. Oil of Galanga.

Galgantöl. — In the root-stocks of Alpinia Galanga (Schwartz). They are pulverised and distilled with water. The water which passes over with the oil has the odour and taste of the roots, and contains carbonate of ammonia. Yellowish white, transparent and colourless after rectification (Vogel); brownish yellow (Raybaud, J. Pharm. 20, 455); lighter than water (Vogel, Raybaud); not very volatile; smells like oil of cajeput. Contains 73:91 p. c. C, 11:67 H, and 14:42 O, and has therefore the composition of cajeput-oil (p. 335). Loses its odour and becomes viscid on exposure to the air. Dissolves partially in aqueous potash, completely and readily in alcohol and ether. (A. Vogel, jun., Repert. 83, 22.)

36. Oil of Gale.

Obtained from sweet gale, Myrica Gale, L., by distilling the fresh leaves with water and cohobating the distillate several times. The yield of oil amounts to 0.65 per cent.—Brownish yellow. Sp. gr. 0.876. Solidifies partially at 17.5°, and changes at 12.5° into a thickish, slightly crystalline mass, mixed with tough, transparent, yellowish laminæ. Odour peculiar, balsamic, and agreeable; taste, mild at first, then transiently burning and permanently astringent. Neutral.—Contains about 70 p. c. camphor, and consists of 81.75 p. c. C, 3.00 H and 15.05 O.—It dissolves iodine without explosion, becoming viscid and olive-green. By fuming nitric acid at mean temperature, and by ordinary nitric acid at 100°, it is converted, with evolution of nitrous acid, into a gold-coloured vol. xiv.

thickish liquid, which becomes turbid on cooling, and does not form a clear solution in water. - With oil of vitriol, it forms a dark brown mixture. — It dissolves in 40 pts. of alcohol of sp. gr. 0.875 at 15, more abundantly in ether. (Rabenhorst, Berl. Jahrb. 35, 2, 220; R perl. 60, 214.)

37. Oil of Geum urbanum.

Nelkenwarzöl. — In the root of wood avens, Geum urbanum, L., where it is obtained by distillation with water, the yield being 0.04 p. c.—Greenish yellow, buttery. (Trommsdorff.) Smells like cloves. Consists of an acid oil, which unites with alkalis and separates from the solution on addition of acids. (Buchner, Repert. 85, 19.) — Dissolves readily in alcohol and ether. (Trommsdorff, 1818, N. Tr. 2, 1, 55.)

38. Oil of Ginger.

Виснноиг. (1817.) Almanach, 1817, 111. MORIN. J. Pharm. 9, 253; Repert. 20, 376.

PAPOUSEK. Wien. akad. Ber. 9, 315; J. pr. Chem. 581, 228; abst. Ann. Pharm. 84, 252,

Inquerol, Essence de gingembre.

Source and Extraction. In ginger, the roots of Zinziber officinal

(Rosc.), whence it is obtained by distillation with water.

Properties. — Yellowish (red, according to Neumann, greenish the

according to Morin), very mobile. (Buchholz.) Sp. gr. 0.893. — Bell point 246°. Has a strong odour of ginger, and a burning aromatic to (Papousek); rather mild, with somewhat biting and bitter afternal (Buchholz.)

Dehydrated.				:	Papousek.
80 C	480		81.49	•••••	81.03
69 H	69	••••	11.72		11.58
5 O	40		6.79		7:39
C*0H64 + 5HO	589		100.00		100.00

Such according to Papousek, is its composition when slowly distilled at a less below 150°.

Decompositions. 1. When strongly heated, it becomes darker and gives up water. — 2. By repeated distillation over anhydrous phopior acid, it is converted into a yellowish oil isomeric with oil of turpenting (87.99 C and 11.88 H).

Combinations. With Hydrochloric acid. CooHaClo = 3(CooHa,HCl) + (*) H¹⁶? — Obtained by passing hydrochloric acid gas to saturation in oil of ginger, washing and distilling the brown product with water, and

dehydrating over chloride of calcium.

				P	apousek.
80 C	480.0	••••	73.45		73·39
67 H	67:0	••••	10.25	*******	10.36
3 Cl	106.5	••••	16.30	••••••	16.25
3(C20H16,HCl) + C20H16	653.5		100.00		100.00

This is the formula assigned to it by Papousek.

39. Oil of Hedwigia.

In the balsam of Hedwigia balsamifera or Bursera balsamifera.—
Obtained by distillation with water. Yellow, transparent oil, which floats on water, has an agreeable odour of turpentine, and a burning tasts.—With ½ pt. nitric acid, it becomes first flesh-coloured, then common, then dark amaranth-coloured, and after 24 hours, brown, but colourless again on being mixed with water; when boiled with 2 pts. of nitric acid, it assumes a yellow colour and becomes resinised.—With oil of vitriol, it turns first yellow, then yellowish red, soon acquiring an empyreumatic taste and odour.—With hydrochloric acid, it assumes first a rose-, then an amaranth-red colour.—It dissolves completely at first in more than 4 pts. of alcohol, and in all proportions of ether. (Bonastre, 1826, J. Pharm. 12, 488.)

40. Volatile Oil of Hemp.

In hemp (Cannabis sativa.) — The fresh herb, just after flowering, is distilled, and the oil-drops which float on the milky distillate containing earbonic acid, are collected. — The yield of oil is 0.3 per cent. — Pale yellow, lighter than water, smells like the fresh herb, tastes aromatic, not burning but strong; its vapour, when inhaled, produces head-ache and slight delirium; a few drops taken internally produce warmth in the threat and stomach, heaviness in the head, and giddiness, but no abdominal derangement. (Bohlig, Jahrb. pr. Pharm. 3, 4. — Repert. 80, 308.)

41, Oil of Hyssop.

STENHOUSE. (1842.) Phil. Mag. 20, 274; J. pr. Chem. 27, 255; Mem. Chem. Soc. 1, 43.

ZELLER. Stud. über äther. Oele, Landau, 1850.

Hyssopol, Ysopol, Essence d'hysope.

Source and Extraction. In hyssop, Hyssopus officinalis, L. It is obtained by distilling the fresh herb or the fresh leaves with water.—
The yield of oil is very large. (Stenhouse.)

Properties. Transparent and colourless (Stenhouse), greenish yellow. (Zeller.) — Sp. gr. 0.88—0.98. (Zeller.) — Passes over between 142° and 162.8°, the last portions being coloured. — Has a peculiar odour and a charp camphorous taste. (Stenhouse.) Neutral. (Stenhouse, Zeller.)

	Stenhouse.						
	æ.		ъ.		e.		
C	84.18		81-29		80-31		
Н	11.00		10.95		10-45		
O	4.82		7.76		9-24		
	100-00		100:00		100-00		

a distilled at 142°; b at 148·3°; c at 168·3°. It is a mixture of several, or at least of two oils. (Stenhouse.)

Decompositions. 1. The oil when exposed to the air gradually become yellowish and resinous. (Stenhouse.)—2. With iodine it becomes lot, gives off yellowish red vapours, turns reddish yellow-brown and thickens (Zeller.)—3. Heated with nitric acid, it yields a yellow resin (Zeller); with 2 pts. of fuming nitric acid, it crackles and forms an unctuous resin (Hasse, Crell. Ann. 1785, 1, 422.)—4. With oil of vitriol, it turns dark yellow-brown, and becomes thick like a balsam. (Zeller.)—5. Dropped upon melting hydrate of potash, it is for the most part converted into a brownish resin, and a volatile oil, which does not smell like hyssop, and is not completely deoxygenated by repeated distillation over hydrate of potash (86.65 p. c. C, 11.41 H, and 1.94 O). (Stenhouse.)

Combinations. Dissolves easily in absolute alcohol, forms a clear

Combinations. Dissolves easily in absolute alcohol, forms a clear solution in 1—4 pts. of alcohol of sp. gr. 0.85, and a slightly opalescent solution with a larger quantity of alcohol of sp. gr. 0.85. (Zeller.)

42. Camphor of Iris florentina.

A. Vogel. J. Pharm. 1, 483. Dumas. J. Pharm. 21, 191; J. pr. Chem. 4, 434; Ann. Pharm. 15, 158.

When iris root is distilled with water, camphor in white scales floats on the distillate (Vogel), and may be separated by filtration. (Dumas.)

Nacreous crystalline laminæ. (Dumas.)

Calculation accor	ding	to :	Dumas.		Dumas.
16 C	96		66.67	••••	67:2
16 H	16	••••	11-11		11.5
4 0	32		22.22		21.3
C16H16O4	144		100.00		100.0

It is insoluble in water. (Dumas.) Dissolves readily in alcohol; the solution has an agreeable odour of violets, and is rendered milky by water.

43. Jasmin-camphor.

Separates in the crystalline form from oil of jasmin when exposed to cold, and may be purified by pressure between paper, solution in alcohol

and recrystallisation. Transparent, colourless, shining laminæ, or white translucent granules, of tallowy whiteness, lighter than water; melts at 12°—15°; has a faint agreeable odour, and a heating camphorous taste. When set on fire, it burns with a bright flame, like rose-camphor. Heated with iodine, it forms a liquid, varying in colour from brown to dark red, and becoming grass green when more strongly heated. With strong nitric acid, it volatilises without evolution of gas, colouring, or formation of oxalic acid. With strong hydrochloric acid, it becomes slightly yellow, forming bubbles and partly dissolving. It does not oxidise potassium. It dissolves sparingly in water, imparting its odour; is quite insoluble in acetic acid, but dissolves with moderate facility in alcohol, in ether, and in oils, both fixed and volatile. (Herberger, Repert. 48, 1081.) As jasmin-oil generally contains a fixed oil, jasmin camphor is perhaps a fixed fatty acid. (Gm.)

44. Oil of Jonquil.

From Narcissus Jonquilla, L. Fresh, recently opened jonquil flowers are introduced into a displacement apparatus, and exhausted by ether made to pass slowly through them; the yellow ethereal solution which runs through and floats on the top of a greenish watery liquid, containing a little salt, is separated from the latter, and distilled in the water-bath; the residual solution is separated by pressure from the jonquil-camphor, which crystallises in warty masses during the distillation and cooling of the liquid; and the ether is left to evaporate spontaneously. Full-blown jonquil-flowers yield jonquil-camphor in yellowish, odourless, sublimable nodules. The oil is yellowish, buttery, melts at the heat of the hand, and has a strong odour of the flowers. Boiling point above 100°. By keeping, it gradually becomes opaque, does not melt even at 100°, and becomes mixed with yellow, granular jonquil-camphor, which separates when the oil is dissolved in ether. Blackens metallic iron when in immediate contact with it.

Brown Jonquil-oil. Contained in peculiar cells of jonquil-flowers, which are not penetrated by the ether. To obtain it the flowers, after having been exhausted with ether, are treated with alcohol, and the alcohol is distilled off from the extract. It is a brown viscid oil, which has an unpleasant odour like that of train-oil, and deposits a few yellow crystals: it is soluble in ether. It unites with alkalis, acquiring at the same time a darker colour. (Robiquet, 1835, J. Pharm. 21, 334.)

45. Volatile Oil of Lançon Balsam.

Obtained by distilling the balsam with water. Pale amber-yellow, colourless after rectification, transparent, lighter than water; solidifies at -12° ; has a peculiar odour like that of tar; tastes sharp, but less so than oil of turpentine and somewhat bitter. Mixed at 20° with $\frac{1}{4}$ pt. nitric acid, it becomes rose-red in 5 minutes, wine-red in 10-12

minutes, dark violet in 20 - 25 minutes, and finally blue. Dissolves in 10-12 pts. alcohol of sp. 2r. 0.85. forming a somewhat turbid liquid, and in all proportions of ther, forming a clear solution. (Bonastre, J. Pharm. 15, 668.)

46. Oil of Lavender.

THÉNARD. (1811.) Mem de la Soc. d'Arc. 2, 32.

SAUSSURE, Ann. Chin. Phys. 4, 318; 13. 273; Schw. 29, 172; Pogg. 25, 370: Bil. univ. 49, 159; Ann. Pharm. 3, 163; Ann. Chim. Php. 49, 159.

VAUGUELIN. Ann. Chim. Phys. 19, 279; Schw. 35, 435; N. Tr. 7, 1, 286.

KANE. Lond. Ed. Mag. J. 13, 444; J. pr. Chem. 15, 163; Ann. Phern. 32, 187.

Bell. Pharm. J. Trans. 8, 276; J. Chim. méd. 25, 487; Pharm. Centril. 1847, 191.

ZELLER. Stud. über äther. Oele, Landau, 1850.

LALLEMAND. N. Ann. Chim. Phys. 57, 404; abetr. Ann. Phorm. 114, 197.

Buence de lavande. Lavandelol, Lavandelessenz.

In the flowers and leaves of the lavender, Lavender angustyolia (Ehrhardt). There are two kinds, viz.: a. Lavender-oil, it the leaves and flowers of Larandula augustifulia (Ehrhardt), and b. Sp oil, Iluile d'aspic, in the leaves and flowers of Lavandula latifitis. (Ehrhardt)

Fresh or dried lavender flowers stripped from the stalks Extraction. are distilled with water or with steam, the lavender-water which pass over with the oil being used for the subsequent distillations. The yield of oil varies with the state of the flowers, and the amount of water distilled from them, as well as with the quantities used; with small quantities of the flowers, the loss of oil is comparatively greater than with larger quantities. The quality of the oil is considerably better, when the flowers are distilled without the stalks: for the disagreeable odcur sometimes perceptible in the commercial oil, proceeds from the stalks, which when distilled alone, yield an oil possessing this bad odos? in a high degree. (Bell.) Dry lavender-flowers yield 1 p. c. oil (Vas Hees, Fharm. Centr. 1847, 380), 1.4 p. c. (Bell.)

Properties. a. Of Oil of Larender: Pale yellow, very mobile Sp. gr. 0.87 - 0.94 (Zeller); 0.803 (Pfaff, Syst. d. Mat. med.); 0.936 (Lewis, Thomson's Syst.); 0.805 at 20; when rectified, the first part of the distillate has a sp. gr. of 0.877 (Saussure); 0.9174; that which distill between 185° and 188° has a sp. gr. = 0.8865 to 0.8745 (Kane); the commercial oil, 0.917; oil prepared by van Hees, 0.892 (van Hees) Boiling point 185° — 188°. (Kane) Tension of vapour: 7.3mm of mercury at 13.75° (Saussure). Has an agreeable odour like that of the flowers; less agreeable if the flowers and stalks have been distilled together. (Bell.) Its taste is burning, somewhat bitter, sharp, and aromatic. Neutral to vegetable colours. (Zeller.) Deposits campber on cooling. (Bizio, Brugn. Giorn. 19, 369.)

b. Of Oil of Spike: Yellow, mobile; sp. gr. 0.87 — 0.89. (Zeller.) Its odour is less agreeable than that of oil of lavender; more like turpentine.

S	aussure			Kan	в.
	a.		ъ.		c.
C	75.50	****	75-77		79.45
H	11.07	****	11.73	*******	11.30
0	13.07	****	12.50	*******	9.25
	99.64		100-00	*******	100.00

a is said to contain 0.36 p. c. N; b distilled at 185°; c, at 188°.

Oil of lavender is a mixture of volatile oil and camphor, corresponding to the formula C¹⁵H¹⁴O², of which the specifically heavier oil contains a comparatively larger quantity. Oil of lavender, from Murcia, contains ½ pt., English oil of lavender ¼ pt., Spanish also ¼ pt. camphor. (Proust.) The camphor of lavender-oil is identical with common camphor. (Dumas,

Ann. Chim. Phys. 50, 225.)

T Both oil of lavender and oil of spike are resolved by distillation into a hydrocarbon, isomeric with oil of turpentine, and a camphor similar to or identical with common camphor. The hydrocarbon from oil of lavender, appears to be the same in molecular condition as the hydrocarbons which are produced from all the oils, C²⁰H¹⁶, by the action of oil of vitriol on fluoride of boron. It boils at 200°—210°, and turns the plane of polarisation to the right. The hydrocarbon from oil of spike, boils at 175°, and turns the plane of polarisation to the left. Both these hydrocarbons form liquid compounds with hydrochloric acid. The portion of oil of spike which distils between 200° and 210° contains a large quantity of camphor, which may be isolated by nitric acid, and acts on polarised light in the same manner and in the same degree as

Decompositions. 1. Oil of lavender, heated for some time above its boiling point, forms a small quantity of acetic acid. (Gay-Lussac, Compt. rend. 1841, 21; Instit. 369, 21.)—2. It absorbs large quantities of oxygen gas at ordinary temperatures, and gives off carbonic acid. At 24 it absorbs the following quantities of oxygen: In the first 12 hours, none; in the two following days, 1.39 vols. daily; in the following week, 6.17 vols. daily; altogether in 4½ months, 111 vols.; in the following 30 months, 8 vols.; therefore, in 34½ months, 119 vols.; in the same interval it forms 22.1 vols. carbonic acid, and becomes somewhat yellowish. Kept over mercury in the shade during four wintermonths, below 12°, it absorbs 52 vols. oxygen, and forms 2 vols. carbonic acid. (Saussure.) It absorbs insolated oxygen, thereby acquiring oxidising properties and the power of reddening litmus. (Schönbein, J. pr. Chem. 52, 187.)—3. When bromine is slowly added to the oil mixed with ½ of its volume of water, heat is produced, and the colour of the bromine disappears till 217 pts. = 4 At. bromine have been added to every 100 pts. of the rectified oil. (G. Williams, J. pr. Chem. 61, 20.) With iodine, it rapidly gives off yellowish-red vapours becomes reddish yellow-brown and viscid, and acquires a balsamic, somewhat acid odour. (Zeller.) It decomposes but slowly with iodine in the cold (Guyot, J. Chim. med. 12, 487), and after an hour or two, forms a thick mixture which dissolves easily in the rest of the oil. (Guyot, J. Phys. 5, 230.) It becomes heated with iodine and explodes, the iodine volatilising.

(Waleker, Prog. 6, 126. Oil of spike reacts with iodine like oil of havender, but with less violent detonation. (Zeller.) - 5. With nitric end it assumes a trawnish to reddish-brown colour, and on heating the mixture strong evolution of gas takes place and a soft yellow resin is formed Zeller together with exalic acid. (v. Grotthuss, N. Gell. 8, 700. Spike-til mixed with nitric acid, turns pale yellow to yellow, and when heated gives off gas and acquires the consistence of balsan. (Zeller. With strong suitharic acid, oil of lavender thickens and assumes a dark red-trawn colour. (Zeller. — 8. With hydrochloric acid gas, it becomes blackish Thomas's reddish-black to black, and specifically heavier but not solid. Thomas's reddish-black to black, and specifically heavier but not solid. Sussaire. It absorbs 68-7 vols. hydrochloric acid and the solid. acid gas Therapi : 210 vols. without being saturated. (Saussure.) -9. With many permit becomes turbid, and at 20° absorbs 47 vols of the gas. Sales = 10. Distilled with 24 pts. water and 8 pts. call the films it gives off carbonic acid gas with effervescence and viel's children. Challent. Compt. rend. 34, 485.) Distilled with April with it wiel's bromoform. (Challent, Compt. rend. 34, 485.) — 12. With it will be proposed and sulphuric acid, it assumes a sulphuric acid, it assumes a sulphuric acid. greenish to brown-yellow colour, and partly resinises. (Zeller.) - 10. When toiled with dry nitroprusside of copper, it yields a slate-grey deposit, the depth of colour varying with the quantity of oil. (Hepps, N. En Ann. 84. 57 - 14. It decolorises very thin films of sulphide of lead, converting that compound into sulphate of lead. (Williams, J. pr. Cien. 33, 304) — 13. When shaken up with \$ of corrosive sublimate, \$ quickly turns brown, without dissolving much of the salt. (Simon, Popp. 57, 857.

Combined on The hydrocarbon (C*His) contained in oil of lavesder op 3730 combines with hydrocally decide and, forming an instable compound which has the a president of hydrochlorate of lemon-oil, C2-H10,2HCl. remains liquid at all temperatures, and does not yield any solid con-pound when treated with fuming nitric acid. (Lallemand.) The hydro-carbon, C' if the contained in oil of spike, forms with hydrochloric acid a liquid compound from which nitric acid separates a small quantity of a solid hydrochlorate, which turns the plane of polarisation to the right but in other respects exhibits the properties of hydrochlorate of oil of turpentine ?

Oil of lavender disselves in assist acid: according to Lallemand, it always, even when recently prepared, contains acetic acid, both free and combined, probably also, valeriante acid. — 80 vols, of the oil shaken ap with 80 vels aretic acid of sp. gr. 1-075, take up 45 vols, of the acid and leave a weaker soil outsining ell, which, if shaken up with 80 rols of fresh ell, produces 110 v ls of ell containing acetic acid, while 5 rols of still weaker acetic acid remain, containing a large quantity of oil separable by water. The vil charged with acetic acid gives up the greater part of that acid when agitated with an equal volume of water. and the whole when agreated with four times the quantity of water. certain quantity of the cit dissolving in the water at the same time (Vauquelin

Oil of laven for disselves in all proportions of absolute alcohol and d ale hel of sp. gr. (185). Heller's of sp. gr. 0.83 (Saussure). It dissolves in 2% pts. of ale hol of sp gr. 0.887 at 20 . (Saussure.) Oil of spike

dissolves in alcohol like oil of lavender. (Zeller.)

47. Ledum-camphor.

RAUCHFUSS. (1796.) A. Tr. 3, 1, 189. MEISSNER. Berl. Jahrb. 13, 170. GRASSMANN. Repert. 38, 53. BUCHNER. Repert. 38, 57; N. Repert. 5, 1; Chem. Centralbl. 1856, 400; N. J. Pharm. 29, 318; Instit. 1857, 82. WILLIGK. Wien. akad. Ber. 9, 302.

Camphor of Marsh Wild Rosemary, Porsch-campher. First observed by Grassmann, 1833.

Source and Extraction. In the volatile oil of marsh wild rosemary Ledum palustre, L. This oil consists for the most part of a hydrocarbon isomeric with oil of turpentine, and of an oxygenated oil, and when recently prepared corresponds to the formula Cook of (Willigk.) It consists of 2 pts. camphor to 1 pt. volatile oil, the camphor existing if the it ready formed, and not being produced from the oil by the action of the air. (Grassmann.) The flowering plant or the leaves are comminuted and very quickly distilled with water; the oil which floats on the distillate is removed and pressed between paper after solidification (Grassmann); and the solidified oil is washed with cold alcohol, and purified by pressure between paper, solution in ether, and recrystallisation. (Buchner.) By slower distillation, the volatile oil passes over first, and afterwards the camphor. (Grassmann.)

Properties. Colourless, slender, transparent prisms (\frac{1}{4}\) inch long, according to Grassmann); when crystallised from alcohol: very delicate silky prisms and efflorescent crystals. (Buchner.) Melts at a gentle heat, sublimes at a stronger heat (Buchner), diffusing a pungent odour which produces headache and giddiness. (Grassmann.) Smells slightly of the herb (somewhat like oil of roses and oil of turpentine), and has a manning argument of the latest of warming aromatic taste. (Buchner.) Neutral. (Grassman.)

50 C	300		81-74		81.25
43 H	43	****	11.71	*******	12.28
30	24		6.55	********	6.47

It contains a hydrocarbon isomeric with oil of turpentine, and a hydrate of that hydrocarbon; $5(C^{10}H^8) + 3HO$. (Buchner.)

Heated on platinum foil, it takes fire, and burns with a highly luminous, sooty flame. (Buchner.) It is nearly insoluble in water. (Grassmann, Buchner.) Dissolves sparingly in hydrochloric acid, still less in acetic acid, not at all in aqueous ammonia, readily in alcohol and ether. (Buchner.)

48, Oil of Lilac.

In the flowers of the lilac, Syringa vulgaris. The fresh flowers are exhausted with ether in a displacement apparatus; the yellow ethereal solution which runs through and floats on the surface of the watery liquid is removed; the greater part of the ether distilled off; the residue left to evacourate and the oil which remains mixed with a solid mass is separated by floration. Amber-yellow, with an odour like that of the flowers. Deposits still masses Syringa-campher, Schm.), when left to itself. Scarcely blackens iron can effect produced in a greater degree by oil of jungal, p. 373. (Favrot, 1838, J. Chim. med. 14, 212.)

49. Camphor of Lily of the Valley.

Compiler for Mailianes. — The fresh flowers of lily of the valley, Commiliants majoris. L. are suspended in the capital of a still and distilled with six times their weight of water, and the camphor which flows on the watery distillate is collected. This watery liquid is slightly table and has no and reaction; its object is fragrant after a few days, but in disagreeable and producing headache of smelt two closesy. The camphor is a radio-crystalline mass. Herberger, Report, 52, 387.

50. Oil of Lime-flower.

BROSSAT. (1820.) J. Floren. 6, 396; abstr. Report. 58, 105. LANDERER. Report. 58, 103. BUCKNER. N. Br. Arch. 8, 70. WINCKLER. Floren. Controll. 1837, 781; abstr. Report. 70, 16.

Source and Exempted at In the flowers of the lime, Tilia Europea, L. The fresh, just opened flowers are distilled with water, and the milky distillate as call latted over fresh quantities of fresh flowers (Brosat, Landerer, or the distillate is mixed with common salt and shaken up with other; the othereal layer is removed and left to evaporate, and the residual oil is rectified over chloride of calcium. (Winckler.) When fresh lime flowers are exhausted with otheride of calcium, and the other distilled off, there remains a preenish-yellow aromatic residue, which solidates on collar, and is deprived by other of its odour of lime-flowers; the othereal solution leaves when evaporated a small quantity of wax and chorophyll, but sourcely any oil. (Buchner.) The amount of oil obtained is 0.1 p.c. Herterger, Kepert, 66, 10: 0.042 p.c. (Winckler.)

For parties. Colouriess. in title (Landerer, Winckler.) yellowsh

Figureties. Colouriess, in title (Landerer, Winckler, yellowsh (Brossat : lighter than water, very volatile (Landerer); has a strong oil or of fresh line-dowers. Winckler: extremely pleasant odour and sweetish taste. Landerer:

Theompositions. 1. Reddens on exposure to light. (Landerer.)—2. Alters slightly on exposure to the light. (Winckler.)—3. It dissolves indicate without rise of temperature, forming a brown liquid, soluble in all proportions of alcohol and ether. (Winckler.)

i

Soluble in alc. A. L. (Landerer.)

51. Oil of Marjoram.

KANE. (1838.) Lond. Ed. Mag. J. 13, 439; J. pr. Chem. 15, 157;
 Ann. Pharm. 32, 285.
 ZELLER. Stud. über. äther. Oele, Landau, 1850.

Majoranöl, Essence de marjolaine.

Source and Extraction. In marjoram, Origanum majorana, L., whence it is obtained by distillation with water. It must be freed from dissolved camphor by repeated distillation. (Kane.) The water which passes over with the oil contains acetic acid. (Hautz, J. pr. Chem. 62, 317.)

Properties. Yellow-green to pale-green (Zeller); sp. gr. 0.8901; rectified, 0.8673 (Kane), 0.89 (Zeller). Boiling point nearly constant at 163°. (Kane.) Has an extremely pungent odour like that of the herb, and a warming acrid, somewhat bitter taste. Slightly acid. (Zeller.)

	Kan	e.
C	a. 86·32 11·41 2·27	84·48 10·80 4·72
	100.00	100.00

a rectified; b distilled at 173.3°.

Decompositions. 1. Deposits camphor when cooled to —15°. (Trommsdorff, N. Tr. 20, 2, 24.) With iodine, it becomes heated and gives off yellow-red vapours without fulmination, acquires a reddish yellow-brown colour, the consistence of a balsam, and a rather acid balsam-like-odour. With nitric acid, it becomes reddish-brown colour, quickly gives off gas, and acquires the consistence of balsam when heated. —4. With oil of vitriol, it acquires a slight bluish-red tint. —5. With bichromate of potash and sulphuric acid, it becomes greenish brown-yellow, and deposits resinous flocks. (Zeller.)

Combinations. It dissolves without turbidity in 1 pt. alcohol of

sp. gr. 0.85, and with opalescence in 2 or more pts. (Zeller.)

52. Marjoram-camphor.

GÜNTHER. (1783.) Alm. 1783, 134. MULDER. J. pr. Chem. 17, 103; Ann. Pharm. 31, 69.

Observed in old oil of marjoram as early as 1686, by Krüger (Miscell. Nat. Cur. Germ. Dec. 2, Ann. 5, Obs. 38), Neumann (Chymia Medica, 2, 1, 182) and Deline (Crell. chem. J. 1, 41).

Formation. When oil of marjoram is kept in loosely closed vessels. (Günther, Mulder.)

Properties. White hard crystals (Mulder), brittle (Günther), heavier than water (Mulder), melts and volatilises completely (Mulder), subliming in laminæ like benzoic acid. (Günther.) Smells and tastes like the oil. (Günther.)

	Mulder 60:07
C	
H	10.70
0	29.23

According to Mulder, its composition may be expressed by the formula C14H1105.

Decompositions. 1. Heated to 112°, it gives off 1.42 p. c. water without becoming turbid (Mulder); does not volatilise so readily as common camphor. (Günther.) — 2. When set on fire it burns with flame, which however does not deposit soot. (Günther.) — 3. It is coloured red by

oil of vitriol. (Mulder.)

Combinations. It dissolves in boiling water. (Günther, Mulder.) Absorbs 12.95 p. c. hydrochloric acid gas, producing a very acid compound, from whose alcoholic solution nitrate of silver throws down chloride of silver. (Mulder.) It dissolves in 10 pts. of concentrated nitric acid. (Günther.) It dissolves in aqueous potash. Does not absorb ammonia-gas. (Mulder.) Dissolves in alcohol and in ether (Mulder), in 10 pts. of alcohol, forming a solution which is not rendered turbid by water. (Günther.) It dissolves in 10 pts. of oil of turpenline, in 10 pts. of boiling oil of almonds, crystallising from the latter solution after a while. (Günther.)

Oil of Wild Marjoram-see Oil of Origanum (p. 391).

53. Oil of Massoy.

In massoy-bark, the bark of Cinnamomum Kiamis, Nees. The comminuted bark is distilled with water, and the milky distillate is separated from an oil which floats on the surface, and another oil which sinks to the bottom, together with a camphor.

a. Light oil. Nearly colourless, mobile, transparent, with an aromatic odour like that of sassafras-oil, and a sharp pungent taste.—
With strong nitric acid, it becomes flesh-red and ultimately cherry-red.—
It dissolves readily in alcohol, ether, and strong acetic acid, and is sepa-

rated from the latter solution by the addition of 3 pts. of water.

b. Heavy oil. More viscid and less volatile than the former. Smells and tastes like sassafras-oil, the odour being fainter than that of the light oil, but the taste equally strong; becomes turbid and thickens at -10°, but does not crystallise. — With cold nitric acid, it becomes flesh-coloured, and when heated therewith, forms a mixture which deposits a small quantity of oxalic acid, and has no bitter taste. — The heavy oil dissolves in all proportions of alcohol, ether, and strong acetic acid, from which last solution it is precipitated by water. Mixes imperfectly with aqueous potash, soda, ammonia, baryta, and strontia, and when shaken up with the two latter, becomes white, thick and turbid, but separates again then left at rest.

c. Massoy-camphor. — White powder, heavier than water, less soft to the touch than fatty substances. — It does not become electrical by friction, is inodorous and nearly tasteless. — It is related to laurin and caryophyllin. — Nitric acid colours it pale yellow, perhaps only in consequence of the presence of a small portion of oil. — Dissolves in hot alcohol and in ether. (Bonastre, 1829, J. Pharm. 15, 204.)

54. Oil of Masterwort.

WACKENRODER. (1831.) Br. Arch. 37, 341. HIRZEL. J. pr. Chem. 46, 292; Chem. Centralbl. 1849, 37; Mitth. d. Zürich. naturforsch. Gesellsch. 1848, 27.

Meisterwurzöl, Essence d'imperatoire.

Source and Extraction. In the root of Imperatoria Ostruthium, L.—
The comminuted root is distilled with water; the oil which floats on the distillate is removed; the water is shaken up with ether; the ethereal solution evaporated; the residual oil, together with the portion previously removed, is rectified with a small quantity of water; and the distilled oil is dehydrated by agitation with chloride of calcium. (Hirzel.)—The yield of oil is 0.78 p. c. (Bartels), 0.18 p. c. (Lecanu.)

Properties. Transparent and colourless (Hirzel), pale yellow (Wack-

Properties. Transparent and colourless (Hirzel), pale yellow (Wackenroder), mobile (the portion which distils between 200° and 220° is more viscid). Boils between 170° and 220°; has an aromatic odour (somewhat empyreumatic between 200° and 220° (Hirzel); penetrating (Wackenroder); its taste is strongly heating (Hirzel); camphorous like that of

poppy-oil. (Wackenroder.)

	Hirzel.						- 47
	a.		ь.		c.		d.
C	85.57		84.40		81.43		81.74
H	11.45	****	11.38	****	11.32		11.27
0	2.98		3.22		7.25	****	6.99
	100.00		100.00		100.00		100.00

a and b distilled from 170° to 180°; c from 200° to 220°. The oil is a mixture of leveral hydrates of a hydrocarbon isomeric with oil of turpentine, corresponding to the lormulæ $4(C^{10}H^8) + HO$ and $3(C^{10}H^8) + 2HO$. (Hirzel.)

Decompositions. 1. Burns when set on fire with a bright fuliginous flame. — 2. It absorbs chlorine, with rise of temperature and evolution of hydrochloric acid gas, being thereby converted into a yellow, viscid oil, which sinks in water, has a peculiar odour, and a biting taste. — 3. It is decomposed in like manner by bromine, with evolution of hydrobromic acid. — 4. By distillation with anhydrous phosphoric acid, it yields a transparent, colourless oil, which has an odour of rosemary and an aromatic taste, agrees in composition (87.76 p. c. C, 11.76 H) with the formula C²⁰H¹⁶, and is therefore isomeric with oil of turpentine. — This oil absorbs hydrochloric acid gas, assuming a reddish yellow colour, and

from my after complete saturation, rectification with water, and dehydramical with chieffer of calcium, an oil which has an agreeable odour, as aromatic tasse and a composition (74.98 C, 10.86 H, 13.28 Cl) agreeing with this from the 3 C² H³ + HCL (Hirsel.)

55. Oil of Matico.

It the leaves if Figure acceptations, a plant growing in Guine. Figure 1997 For. — The leaves are distilled with water, and the oil which shows this is the bottom of the milky distillate is collected.— Pale green, thickes has a strong and persistent odour, and a persistent campaigness take. — By keeping, it becomes thicker, and ultimately crystalline. It was a strong and it is coloured amber-yellow and resinised.— It has lives in all property forming a carmino-coloured liquid which becomes in lay to add to a water. It dissolves readily in alcohol and silen, not in process packed to remark. (Hodges, 1844, Phil. Mag. J. 51. 114. Mag. J. 1153.

56. Neutral Oil of Meadow-sweet.

LIVE & WEIGHANS. (1888.) Popp. 46, 57; Pharm. Centr. 1888, 1234.

Errent: Aus. Phora. St. 241; Phora. Contr. 1840, 837.

Now to the of System.

South In the fivers of meanwaveet. Spirars ulmaria, together with salery has an interpretable marrier. (Ettling, comp. xii, 235.)

The water limit which passes over on distilling the fivers with water is smaken up with ether; the ethereal solution is securated from the water and smaken up with potash-ley to remove salaryous and another residual ethereal liquid is evaporated at a gentle boats. I would be impure —2. The chi obtained by distilling the fivers is staken up with potash-ley if sp. gr. 1-28, redistilled either alone or with water and required after debydration with chloride of calculate. The water of its . Entire

Foreverse Transparent reliables till which floats on water, bold more than it that there is meanly that there is nearly severe is neutral; has a strong clear somewhat for that it salevines soid and a slightly burning taste. Young — it soid ies that it salevines soid. (Lowing & Weidmann) long a Weidmann read in the in 1911 per C 1935 H. and 1844 O: hence his personal read of the interest in turns first yellow, they hardened we that the read in oxygen — The oil which has

The marker-constant with a represent to the air, it turns first yellow, they harker-constant within taking up exyren. — The oil which has passes over in most feation grains, y turns brown and deposits small colouriest special crossals. Entirely—2. It is violently attacked by other ret with crossals and regiment established becoming vised but not so if the appropriate acid, becoming vised but not so if the appropriate acid, becoming milky who and depositing a sense quartery of apparently unaltered oil.—4. It leaves to have an unaltered and lives not recited solutions of ferric subspicious.)

Il dimella maile in ini en en inima (Enting)

57. Oil of Mecca Balsam.

Obtained from Balsamodendron gileadense (Kunth.) by distillation with water, the quantity amounting to 10 per cent. (Bonastre), 30 p. c. (Trommsdorff, N. Tr. 16, 1, 72.) — Transparent, colourless, mobile. (Bonastre, Trommsdorff.) Sp. gr. 0.876. Does not solidify at —12°. Has a strong odour of turpentine (Bonastre); agreeable like that of the balsam (Trommsdorff); has a strong taste, somewhat pungent, not bitter but cooling. (Bonastre.) Neutral. Contains 80.03 p. c. C, 11.50 H, 8.42 O. (Trommsdorff.) — Burns with a bright flame when set on fire. Dissolves iodine with a brown colour and without explosion. (Trommsdorff.) It is scarcely coloured by strong nitric acid (Bonastre), but mixes with it quietly, the mixture becoming warm after a while, giving off nitrous acid, and depositing, on addition of water, a brittle pale yellow resin which has an agreeable odour like that of musk. (Trommsdorff.) — With oil of vitriol, it becomes saffron-red (Bonastre), dark red without rise of temperature; the mixture, on addition of water, deposits a fragrant pale yellow resin. (Trommsdorff.) — It dissolves with turbidity in 12 pts. of alcohol (Bonastre); clearly and in all proportions in ether, easily in rock-oil, fixed oils, strong acetic acid (Trommsdorff), not at all in aqueous potash (Trommsdorff), soda and ammonia. (Bonastre, J. Pharm. 18, 97.)

58. Volatile Oil of Mentha viridis.

Obtained by distilling spear mint, Mentha viridis, L. with water. Sp. gr. 0.939 (Brandes); 0.9142, after separation of the dissolved camphor by rectification, 0.876. (Kane.) Boils with tolerable regularity at 160°. Contains 84.21 p. c. C, 11.23 H, and 4.56 O, and is therefore 7C°H⁴ + O. (Kane, Lond. Ed. Mag. 13, 440; J. pr. Chem. 15, 163.)

59. Oil of Mercurialis annua.

Obtained by distilling the dry herb with water (the fresh herb does not yield any oil). — It contains numerous white crystals; becomes coloured and thickens by keeping. (Raybaud, 1834, J. Pharm., 20, 461.)

60. Oil of Mignonette.

In the flowers of mignonette, Reseda odorata, L. They lose their odour when dry, but yield by distillation with water, an aqueous liquid, having an odour of mignonette, but at the same time a disagreeable grassy odour, and with alcohol, a distillate of not very agreeable odour. — To prepare the oil, the flowers are exhausted with ether; the green ethereal layer of the extract is separated from the lower watery layer,

and left to evaporate spontaneously.—Soft dark green mass, smelling strongly of mignonette, and consisting of chlorophyll, wax and oil; the oil cannot be separated from it. (Buchner, N. Br. Arch. 8, 70.)

61. Oil of Millefoil.

BLEY. (1828.) N. Tr. 16, 1, 247; further, 16, 2, 96. — Repert. 48, 95. FORCKE. N. Br. Arch. 17, 177. ZELLER. Stud. über äther. Oele, Landau, 1850.

Schafgerberöl.

Source and Extraction. In millefoil, Achillea millefoliam, L. Obtained by distilling with water the flowers, herb, roots, or seeds.—Water distilled over the flowers contains propionic acid together with the oil (Kamer, N. Br. Arch. 54, 9); water distilled over the roots contains acetic acid together with the oil (Bley).—The roots yield 0.032 p.c.; the dry herb, 0.065; the first dried flowers. 0.114; the air-dried seeds, 0.052 p.c. oil (Bley).

Properties. 1. From the flowers: Dark blue (Zeller); from Achilles

Properties. 1. From the flowers: Dark blue (Zeller); from Achiller millefolium r.r. dilatata. yellow to green; from var. contracta; blue (Forcke). Sp. gr. 0.92 to 0.928. Has a slight acid reaction. — (Zeller.)—2. From the herb: Blue, darker than oil of wild chamomile; visid, nearly buttery in the cold, lighter than water; from the plant while flowering. 0.852—0.917. Has a strong smell and tastes like the herb, producing a slight scratching sensation in the throat. (Bley, Zeller.)—3. From the roots: Colourless, slightly yellowish, lighter than water, with a peculiarly unpleasant odour, somewhat like that of valerian and a disagreeable taste, but neither strong nor burning. (Bley.)—4. From the scale: Greenish. (Bley.)

Decompositions. 1. By exposure to the air, it becomes brown, strongly acid and resinous. — 2. Stirred up with iodine, it becomes heated, without detonating, and gives off yellowish-red vapours, at the same time acquiring the consistence of a balsam. (Zeller.) — 3. With nitric acid, it acquires a reddish-brown colour: with fuming nitric acid, greenish-brown: when heated therewith, it quickly gives off gas (Zeller.) and leaves a soft resin. (Bley, Zeller.) — 4. Oil of vitriol colours it brown and thickens it to the consistence of a balsam, giving off a peach-like odour. (Bley, Zeller.) With historimate of potash and sulphuric acid, it becomes turbid and thickens. (Zeller.)

Combountiers. — With agreems potath or ammonia, it forms a scapy compound. (Bloy.) — It dissolves readily in alcohol and ether (Bloy); without turbidity in 1 pt. of alcohol of sp. gr. 0.85; with a large quantity, even with 40 pts., it forms a turbid solution, holding flocks a suspension; absolute alcohol dissolves it in all proportions. (Zeller.)

62. Oil of Noble Millefoil.

From Arbillet with its I.—Obtained by distilling the flowering plant or the flowers, Letb or seeds with water. — The dry flowers yield 024 p. c.; the dry herb, 0.26, the seeds, 0.00 p. c. oil. — Pale yellow, visid;

of sp. gr. 0.983; if obtained from the herb, 0.970; has a very powerful odour, finer than that of the oil obtained from common millefoil, but resembling it, and also like that of camphor. Tastes aromatic, like camphor, somewhat bitter. — With iodine, it forms, without explosion or rise of temperature, a solution, which, on addition of water, deposits a brown resin having a burning taste. — With fuming nitric acid, it becomes hot and yellow, thickens, and on addition of water, yields a soft, floating resin. — With oil of vitriol, it becomes red-brown and viscid; on addition of water, the mixture deposits a dirty-yellow soft resin. — The oil dissolves in ether, alcohol, and oils, both fixed and volatile. (Bley, N. Br. Arch. 2, 124.

63. Oil of Mugwort.

Beifussöl. In the root of mugwort, Artemisia vulgaris, L.— The root is comminuted and distilled with water.— Pale greenish-yellow, buttery, crystalline, lighter than water; boils above 100°, has a peculiar pungent odour, and an unpleasant, somewhat bitter taste, burning at first, afterwards cooling. Neutral.—It is not easily inflammable, but when once set on fire, burns with a light yellow, sooty flame, which diffuses an offensive odour.—It is quickly thickened by dilute nitric acid, giving off nitrous acid, and yielding a tough brown resin, soluble in alcohol.—The oil dissolves readily in alcohol, ether, oil of rosemary, oil of turpentine and poppy-oil. (Bretz & Eliason, 1826, Taschenbuch, 1826, 61.)

64. Oil of Myrtle.

In the leaves, flowers, and fresh fruit of Myrtus communis. — Obtained by distillation with water. — Yellow to greenish yellow, lighter than water. (Raybaud, 1834, J. Pharm. 20, 463.)

65. Oil of Nasturtium.

MÜLLER. (1838.) Ann. Pharm. 25, 209; N. Br. Arch. 14, 265; Repert. 70, 286.

Berangs. Repert. 88, 382.

CLOEZ. Recueil de trav. de la Soc. d'emul. p. l. sciences pharm. 1847, 41; abstr. N. J. Pharm. 12, 69.

Kapuzinerkressenöl, Huile essentielle de capucine.

In the garden nasturtium, Tropæolum majus. L. — The plant (especially the seeds, according to Bernays) yields by distillation with water 2·17 p. c. of oil. (Müller.) — The water which passes over with the oil, gives off a large quantity of sulphuretted hydrogen when heated with zinc and oil of vitriol. (Bernays.)

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Yellow (Müller, Bernays); heavier than water. (Bernays, Closz) Boiling point between 120° and 130°. (Closz.) Has a peculiar, strongly aromatic odour, which irritates the eyes and nose (Müller), like oil of garlic (Bernays). Taste acrid and burning (Müller), pungent (Bernays). It irritates the skin much more strongly than oil of mustard (Müller.) - It contains sulphur (Bernays, Cloez), but not phosphorus, w Bracounot supposed. (Bernays.) - It should have been treated as described at south but no your page 56, vol. x.

66. Oil of Neroli.

BONASTRE. (1825.) J. Pharm. 11, 529; N. Tr. 12, 1, 180. BOULLAY. J. Pharm. 14, 496. Zeller. Stud. über äther. Oele, Landau, 1850.

Relating especially to Orange-flower water.

ADER. (1830.) J. Pharm. 16, 412. LE Roy. J. Chim. med. 6, 313. WAHART DUNESMAL. J. Pharm. 16, 410; N. Tr. 23, 1, 307. Soubeiran. J. Pharm. 17, 619; N. Tr. 23, 1, 307. BOULLAY. Bull. Pharm. 1, 337. Guisney. J. Chim. méd. 22, 352.

Oil of Orange-flower, Pomeranzenblüthenöl, Orangenblüthenöl, Essence Néroli.

Source and Extraction. In the flowers of the orange, Citrus Aurustium, L. — They are distilled in the fresh state with water. The of which passes over is a mixture of two oils, one easily soluble in water and very fragrant; the other, sparingly soluble, of loss agreeable odour; the latter floats upon the watery distillate, and is easily separated (Soubeiran.)

Properties. Transparent, colourless (Bonastre), yellow to brownish yellow. (Zeller.) Sp. gr. 0.85 to 0.90. (Zeller.) — Has a very fragrat odour. (Bonastre.) Neutral. (Zeller.) Contains neroli-camphor in solution.

Decompositions 1. Becomes reddish yellow by keeping. (Bonasta) - 2. With iodine, it froths up, gives off violet and yellowish red vapers, and is converted into a soft yellowish brown mass. (Zeller.) - 3. Wie nitric acid, it assumes a yellow colour gradually changing to that of incrust, and becoming red-brown after six hours, and ultimately lose is odour (Bonastre); on applying heat, the mixture rapidly gives off gas and acquires a resinous consistence. (Zeller.) — 4. With oil of vitral acquires a resinous consistence. acquires a dark orange-yellow colour (Paoli), dark red-brown, and become viscid. (Zeller.) — 5. Bichromate of potash colours it red-brown and separates resin from it. (Zeller.) — 6. In contact with platinum-blad it produces a peculiar acid. (Döbereiner.)

Combinations. It dissolves clearly in 1-3 parts of alcohol of sp. re-

0.85, and with turbidity in a larger quantity. (Zeller.)

Appendix; Orange-flower water. Aqua napha. This is the aqued distillate which passes over on distilling fresh orange-flowers and

water, —freed from the oil of neroli which floats on the surface. — It contains especially the more fragrant and more volatile oil of the flowers, which dissolves most readily in water (Soubeiran), and cannot therefore be prepared by agitating the neroli-oil with water (Le Roy), or by agitating with water neroli-oil triturated with magnesia (Cottereau), or by distilling a mixture of neroli-oil and water. (Sou-

beiran.)

Fresh orange-flowers, which have expanded in warm weather, are distilled with water, till the distillate amounts to three times their weight.

Neutral water then passes over first, afterwards water containing acetic acid; if flowers freed from the flower-leaves are distilled, the distillate is neutral to the end, but has a less agreeable odour. — Water, free from acetic acid, is obtained by distilling orange-flowers with water mixed with about 0.75 p. c. of calcined magnesia. — Transparent, colour-less, with a pleasant odour of orange-flowers, more or less powerful,—fragant in the highest degree when prepared with orange-flowers which have expanded in warm weather. (Boullay.) — By keeping, it readily turns sour, from formation of acetic acid, but does not lose its odour. (Journeil, J. Chim. méd. 18, 752). — With nitric acid, it acquires in a few minutes a rose-red colour (Ader and others),—or crimson with a larger quantity of acid, or if the mixture is heated. (Ader.) The colour of a mixture of nitric acid and orange-flower water in equal volumes remains unaltered for a long time, and is especially lasting in a mixture of nitric acid with orange-flower water containing aqueous potash, ammonia, or baryta; it disappears in this mixture on addition of potash, but re-appears on supersaturating the liquid with nitric acid. (Ader., Wahart, Dunesmal.) — With oil of vitriol, but only with the commercial acid containing nitric acid. (Ader.) — It is not coloured by phosphoric or hydrochloric acid. (Ader.)

Ether, almond-oil, and castor-oil abstract from orange-flower water the whole of the volatile oil; the ether solution, mixed with nitric acid, immediately assumes a rose-colour, and leaves on evaporation a fragrant volatile oil. (Ader, Soubeiran.) — Artificial orange-flower water, prepared by agitating with water, either oil of neroli, or the same triturated with magnesia, or by distilling a mixture of neroli-oil and water, differs from real orange-flower water by its stronger, but less agreeable, odour, which soon disappears when the oil is exposed to the air,—as well as by being not at all, or but slightly, reddened by nitric acid. (Ader, Sou-

beiran, Gaisney.)

67. Neroli-camphor.

Boullay. (1828.) J. Pharm. 14, 496.
PLISSON. J. Pharm. 15, 152; N. Tr. 20, 1, 189; abstr. Ann. Pharm. 40, 83; J. Pharm. 20, 63.
Landerer. Repert, 56, 84.

Aurade, Auradine. (Plisson.)

Source and Extraction. Contained in solution in fresh oil of neroli.

Separates from the oil when kept for some time (Landerer) from the

alcoholic cil by slow evaporation. (Plisson.) — To prepare it, oil of newline mixed with alcohol of sp. gr. 0.85, as long as a white precipitate is energy produced; the liquid is filtered after a while, and the precipital shed with cold alcohol (Boullay), then dissolved in ether, and the obtion either precipitated by alcohol or left to evaporate in the air. Fred all of merch yields 4 p. c. of the camphor; oil a year old, yields less us ulder oil, none. (Plisson.)

Properties. White crystals, having a pearly lustre (Plisson); slesing a pearly lustre (Plisson); slesing spermed. (Plasson.) Sp. gr. 0-913 at 17:5". Becomes soft at 50°, melts at 55°; salidifies on cooling to a waxy, translucent mass; volatilises and sublime at a stronger heat, (Plisson.) — Melts at 100°. (Boullay.) — Without taste or odour. (Plisson.) Smells like neroli-oil, and has a sharp taste (Landever.) Neutral. (Plisson.)

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Decompositions 1. Unaltered by exposure to the air, volatilist partially when heated in vessels containing air, and leaves a brown (Plisson) - 2. Boiled with nitric acid, it volatilises partially and partly remains undecomposed. Impure crystals thus treated give off vapours smelling like musk and ambergris. (Plisson.) The untra-acid solution deposits wax when mixed with water. (Landerer)-3. Heated with oil of vitriol, it chars and evolves sulphurous sel. (Plisson.) It is not decomposed by hydrochloric acid. — 5. Potasi don

not suponify it. (Plisson, Boullay.)

Combinations. Neroli-camphor is insoluble in toater (Blisson, Boallay); sparingly in cold, readily in hot alcohol (Boullay, Landerer); in 60 pts. alcohol of sp. gr. 0.9, separating in indistinct scales on coding. It dissolves abundantly in ether, and is precipitated from the solution by addition of water or alcohol. (Boullay, Plisson.) It dissolves in he acetic acid (Landerer), very easily in hot oil of turpentine, separating

completely in transparent laming on cooling. (Plisson.)

68. Oil of Nigella.

Schwarzkümmelöt. In the seed of Nigella sativa, L. Prepared by intilling the bruised seeds with water. Transparent, colourless, exhibiting a bluish iridiscence by reflected light; lighter than water; smells like a mixture of oil of fennel and bitter almond-oil. Distilled with agreed notash, it gives off a non-iridescent oil having a faint odour, while then remains a strong-smelling residue, which, after supersaturation with salphuric acid, smells like camphor and deposits an abundance of white flocks. On washing these white flocks with ether, and evaporating the adhering ether, they change into a buttery oil smelling like campber, which exists ready-formed in the original oil (is probably produced therefrom by the action of hydrate of potash: Gm.). It dissolves in alcohol and ether, the solution exhibiting a bluish iridescence by reflected light (Reinsch, Jahrb. pr. Pharm. 4, 387.)

69. Oil of Nutmeg.

BLEY. N. Tr. 14, 1, 34. — Repert. 48, 94.
MULDER. J. pr. Chem. 17, 108; abstr. Ann. Pharm. 31, 71.

Muscatnussöl.

In nutmeg, the seed of Myristica aromatica, Lam. The seeds distilled

with water yield 6 p. c. of oil. (Bley.)

Properties. Transparent, colourless, mobile (Hasse, Orell. Ann. 1785, 1,422), nearly colourless (Bley). Sp. gr. 0.948 (Lewis), 0.920 (Bley). Smells of nutmeg and camphor, and has an aromatic burning taste. (Bley.) It contains 81.13 p. c. C, 10.83 H, 8.04 O, and is a mixture of oil and camphor. (Mulder.) Consists of two oils, one lighter than water, the other heavier. (Hasse.)

oil and camphor. (Mulder.) Consists of two oils, one lighter than water, the other heavier. (Hasse.)

Decompositions and Combinations. 1. The oil gradually turns yellowish when exposed to the air. (Hasse.)—2. With fuming nitric acid, it becomes very hot, and forms a yellow fatty mass (Bley), a brown solid resin (Hasse).—3. With oil of vitriol, it forms a red-brown resinous mixture.—4. Heated with mercuric chloride, it first turns brown, then black, giving off a large quantity of acid vapours. (J. Davy, Phil. Trans. 1822, 360.) It unites with aqueous alkalis, forming a soapy mass. (Bley.) It dissolves readily in alcohol, forming a solution which becomes milky on addition of water. (Hasse.)

70. Nutmeg-camphor.

JOHN. (1821.) Dessen chem. Schriften, 6, 61; Schw. 33, 249. BLEY. N. Tr. 1, 56. MULDER. J. pr. Chem. 17, 102; Ann. Pharm. 31, 62.

Myristicin, Muscatcamphor.

Deposited from nutmeg-oil; purified by recrystallisation from water.

Transparent, colourless, long, very thin prismatic tables, with dihedral summits; by rapid crystallisation: stellate groups of needles (John), finble, white hemispheres, heavier than water (Mulder), lighter than water (Bley). Melts above 100°, and evaporates, leaving charcoal (Bley); sublimes completely at a higher temperature in white very slender needles. (Mulder.) Has an aromatic taste and odour (John), like oil of nutmeg (Mulder).

	Mulder.
C	62-1
H	10.6
0	27.3

Agrees with the formula C16H16O6 (Mulder); C20H20O6 (Gm.)

It yields by distillation, first a transparent and colourless, then a yellow volatile oil, and an alkaline water, having an aromatic burning

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The less contract and make the contract Manders in warm oil, but the mile than the contract that the

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72. Oil of Olibanum.

In implements, the process of Bisselia doribunda, (Royle) and Bisselia doribunda, (Royle) and the first with finite in the list late is debydrated by agitation with the true of manner. The product is 0.4 p. c. of limpid oil of sp. p. 1.5 if at 1.4 and building point 162. It smells like turpentine but not agreeably.

		100	0.00
Ü			4-90
H	-	1	1 · 27
C			3.83

It is is meric with the oil of Mentha viridis, and agrees with the formula C^MH²⁰O Stenhouse; it contains an oxygenated and a new oxygenated oil. (Lowig, Org. Verb. 2, 1027.) Burns when set on it with strongly luminous, sooty flame. Mixed with nitric ocid, it assume a dark brown colour, and, when heated therewith, detonates and acquired a resinous consistence. Oil of vitriol colours it red in the cold and chard when heated. Heated with caustic potash, it is converted into a lower resin. It dissolves in all proportions in absolute alcohol and ether, less in

ker alcohol. (Stenhouse, 1840, Phil. Mag. J. 18, 185; Ann. Phil. 106.)

2-P BANKS BRAIL OF SET THE ...

73. Oil of Origanum.

Ya . Mr. 3 /1 B4 / KANE. Lond. Ed. Mag. J. 13, 439; J. pr. Chem. 15, 157; Ann. Pharm. 32, 285.

Zeller. Stud. über äther. Oele, Landau, 1852.

Dostenöl, Essence d'Origan, Oil of Wild Marjoram.

Source and Extraction. In wild marjoram, Origanum vulgare, L.

Obtained by distilling the plant in the flowering state with water. Properties. Pale to brownish-yellow. (Zeller.) Sp. gr. 0.909 (Brand); 0.8901 — 0.909, rectified, 0.8673 (Kane); 0.87 — 0.97 (Zeller). Boils almost constantly at 161°. (Kane.) Smells strongly of the plant, and has a sharp aromatic taste. Neutral.

	Kane.						
C	86.71	86.08	86-33	86.18			
	11.11						
0	2.18	2.48	2.23	2.18			
	100.00	100.00	100.00	100.00			

It is a mixture of oil and camphor, corresponding to the formula C50H40O.

Decompositions. 1. Deposits camphor after long standing. - 2. With yellow-red vapours and becoming viscid. (Zeller.)—3. With nitric acid, it becomes brownish-red to yellow-brown, giving off gas with violence when heated, and leaving a solid yellow resin. (Hasse, Zeller.)—4. With oil of vitriol, it becomes dark blood-red.—5. With bichromate of potash and sulphuric acid, it becomes dark brown. (Zeller.) — 6. Heated with a concentrated aqueous solution of bisulphite of ammonia or soda, it is resolved into a permanently liquid hydrocarbon belonging to the camphenes, and a white solid mass which, when washed with alcohol, ether, and water, presents the appearance of a white amorphous powder Akad. Ber. 13, 169; J. pr. Chem. 64, 29; Chem. Centr. 1854, 723.)

Combinations. Dissolves in 12 — 16 pts. alcohol of sp. gr. 0.85,

forming a turbid liquid. (Zeller.)

74. Oil of Parmelia parietina (Achard.) d puringul to the

The lichen is distilled with water, 20 lbs. of it yielding 5 grains of the oil. Light green (colourless, according to Hinterberger (Repert. 47, 199), of buttery consistence, lighter than water. It has a musty smell and taste, producing an after-sensation of scratching in the throat. (Gumprecht, 1824, N. Tr. 1, 1, 62; Repert. 18, 241.)

75. Oil of Pelargonium,

RECLUZ. (1829.) J. Pharm. 13, 529. C. and P. SIMONNET. N. J. Pharm. 13, 43. Guibourt. N. J. Pharm., 15, 346.

Source and Extraction. In Pelargonium odoratis-simum, P. roseum, Willd., and P. capitatum, Art. The fresh flowers and leaves are distilled with water, and the distillate is repeatedly cohobated over new portions.

Properties. Transparent, colourless, viscid like palm-oil (Simonnet), pale-yellow, mobile (Guibourt); solidifies in a white crystalline mass below 18° (Recluz), becomes turbid, without solidifying, when cooled to 0° (Guibourt); and lemons (Guibourt), and (Guibourt); smells like roses (Simonnet) and lemons (Guibourt), and has a warming taste (Guibourt). It contains pelargonic acid (xiii, 369) and a neutral oil. (Pless, Ann. Pharm. 59, 54.)

In iodine-vapour it becomes brown after a few seconds, then black. In nitrous acid vapours it turns apple-green. Mixed with oil of vitrol, it yields a brown oil, having a strong and unpleasant odour. (Guibourt.)

It dissolves readily in alcohol of sp. gr. 0.85. (Simonnet.)

76. Oil of Pimpinella.

a. From the root of the common Burnet-saxifrage, Pimpinella Saxifraga, L. The root is distilled with water; the yellow oil-drops which pass over with the water are collected; and the water is partly redistilled to obtain the oil. Gold-yellow, mobile oil, which floats on water, has a strong penetrating odour like parsley seeds, and a disagreeably bitter taste with scratching after-sensation. — Fuming nitric acid colours the oil red, and converts it into a brown, balsamic, resinous mass. - It dissolves slightly in water, easily in alcohol and ether, imparting to

those liquids its strong taste and odour. (Bley, N. Tr. 12, 2, 62.)

b. From the root of Pimpinella nigra, Willd. — The root contains
0.38 p. c. of the oil, which is obtained from it by distillation with water.

Light blue oil which floats on water. Its odour, like that of the root, is less penetrating than that of the preceding oil; its taste, also like that of the root, is burning, and afterwards scratching. — In sunshine, it turns green after a few weeks, even in closed vessels. — Fuming nitric acid converts it into an odourless crystalline resin. — Oil of vitriol forms with it a brown odorous resin. — It dissolves slightly in water, easily in alcohol, ether, and oils, both fixed and volatile.

77. Oil of Poplar-buds.

In the buds of the black poplar, Populus nigra, whence it is obtained by distillation with water. - Colourless, fragrant oil, which floats on water. It makes stains on paper which are completely dissipated by heat; burns with black smoke when set on fire; is sparingly soluble in alcohol, very soluble in ether. (Pellerin, 1822, J. Pharm. 8, 428; abstr. 15, 237.)

Oil of Pyrethrum-sec Oil of Feverfew (p. 369).

78. Raspberry-camphor.

Expressed raspberries are distilled with water; the flocks which separate after a while from the distillate are collected and dissolved in ether; and the solution is left to evaporate.—Small laminæ, some of which float on water, while others sink.—Volatilises readily when heated. With cold oil of vitriol, it assumes a yellowish colour, without losing its odour; with hot oil of vitriol, it turns violet-brown, giving off a large quantity of sulphurous acid.—It dissolves in water, in aqueous ammonia, and in aqueous potash, with the odour of violets when heated.—It dissolves in alcohol and in ether. (Bley, 1837, N. Br. Arch. 132, 48.)

79. Oil of Roses.

SAUSSURE. (1828.) Ann. Chim. Phys. 13, 337.
BLANCHET. Ann. Pharm. 7, 154; Repert. 50, 134.
GÖBEL. Schw. 58, 473.
GUIBOURT. N. J. Pharm. 15, 345.
ZELLER. Stud. über äther. Oele, Landau, 1850.

Rosenöl, Essence de rose.

Source and Extraction. In the flowers of Rosa centifolia, L., R. moschata, Gesn. R. sempervirens, L., and R. damascina, Mill.— The fresh rose-leaves are distilled with water, the solidifying oil which floats on the watery distillate is removed; and the water is cohobated several times over fresh quantities of roses.— In India, the oil which floats on the water is collected by dipping into it sticks covered with cotton, and then pressing the cotton. (Chéreau, J. Pharm. 1826, 436.)—A larger quantity of rose-oil is obtained, by leaving the roses freed from their calices, in contact with water for some days before distillation, till they begin to ferment and acquire a vinous odour. (Cenedella, Gazz. eclet. di Chim. med. Agosto, 34.)—In Arabia, roses are distilled with solution of common salt without cooling; the distillate is poured into earthen vessels buried in the ground, and the solidified oil which rises to the surface is removed. (Landerer, Repert, 77, 378.)—In Macedonia, the expressed juice is exposed to the sun for 5 or 6 days (Landerer, Repert, 96, 401), in Bengal, roses steeped in water are thus exposed, and the oil which then floats on the surface is soaked up with cotton. (Monro, Bull. Pharm. 3, 177.)

Pharm. 3, 177.)

Properties. Transparent, colourless (Saussure), slightly coloured (Göbel, Blanchet), greenish yellow (Guibourt), brownish yellow. (Zeller.) Sp. gr. at 33° = 0.832 (Saussure); at 25°, 0.867 — 0.872 (Chardin, Ann. Pharm. 7, 154); German rose-oil, 0.814; Persian, 0.832. (Zeller.) — Solidifies above 0° to a buttery mass (Saussure), to a white, transparent, laminated mass (Göbel), at 26° (Blanchet), at various temperatures (Guibourt), at 25°. (Zeller.) — When slowly cooled, it remains transparent, and appears traversed by slender, shining, iridescent laminæ (when adulterated with spermaceti, it becomes opaque); by rapid cooling

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e manus (T. 1.2 manus. It is a mixture of volatile oil and complet Sensors. maximis of a manuscript.

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minimum. The nl massives sparingly in water. — At 187, it issues in 186 years at account if so, gr. 0.815 (Göbel); at 14° in 143 years in 160 in 163 years are done if so, gr. 0.806 (Saussore.) — The oil is not separated from its alreadone solution by water (Blanchet); but from its action is succeed by water (Blanchet); but from its action is succeed in by platfinam-black and platinic oxide, when therefore actions the protection of glowing when dried and heated to 1.00°. Decrease Since 16. 35%

80. Rose-camphor.

SATSSTRE 1827 Ave CVm. Phys. 13, 337. BLANTEST, Ave. Flore, 7, 154. HERRIER Ave. Aver. 48, 102.

Sills Russell. Steamgrees of Rise-oil.

Some and Experience. In rose-oil.—Separates from rose-water in the cell.—1. The oil is cooled and pressed between bibulous paper when solid.—Saussure.)—2. Rose-oil is mixed with 3 pts. alcohol of sp. gr. 0~75: and the crystalline mass which then separates is dissolved in other, precipitated therefrom by addition of alcohol, and freed from adhering oil by repeated washing with alcohol. (Blanchet)

adhering oil by repeated washing with alcohol. (Blanchet.)

Properties. Transparent. colourless, shining laminæ (Saussure): sixght-sided crystals (Herberger), which exhibit the colours of the
ow. (Guibourt, N. J. Pharm. 15, 345.)—It has the consistence of

wax (Saussure); when separated from rose-water, it is a white, buttery, crystalline mass (Blanchet); from concentrated rose-water it crystallises in six-sided laminæ. (Steinacher.) - Lighter than water, lighter also than rose-oil containing the camphor (Saussure, Herberger); heavier than alcohol. (Herberger.)—It is buttery and crystalline at 25°, melts at 35°, boils without decomposition at 280°—300° (Blanchet); melts at 33°-34° (Saussure); melts to a colourless oil at 15°, and at a higher temperature solidities in the crystalline form, leaving a small quantity of charcoal (Herberger); after being kept for a year, its melting point rises from 15° to 20°. (Bizio.) Solidifies again at 35°. (Blanchet.) Tension of vapour = 0.0005 met. at 14.5°. (Saussure.) - Has a faint odour of roses. (Blanchet, Herberger.) Smells of roses, even after being three times sublimed over ignited charcoal, or after its alcoholic solution has been treated with animal charcoal. (Herberger.) Has a somewhat warming aromatic taste. (Herberger.)

C H				
	101.63	********	95.48	

Agrees with the formula C16H16. (Blanchet.)

Decompositions. - 1. When set on fire, it burns with a bright nonfuliginous flame. (Blanchet.) - 2. Chlorine passed into an alcoholic solution of rose-camphor, produces a white odourless precipitate. -3. With nitric acid, it turns yellow, dissolves with slight evolution of gas, loses its odour, and forms oxalic acid. - 4. It is dissolved and turned brown

by oil of vitriol. — 5. It is not altered by potassium. (Herberger.)

Combinations. Very sparingly soluble in water. (Herberger.) After being moistened with alcohol, it unites with iodine, without rise of temperature or detonation; the compound partly volatilises undecomposed when heated. It dissolves very sparingly in hydrochloric acid, with difficulty in aqueous potash, more easily in aqueous ammonia. — The solution of rose-camphor in alkalis and alkaline carbonates does not possess any odour of roses, or even acquire it after supersaturation with acids. (Herberger.)

Rose-camphor is soluble in acetic acid. (Herberger.)

It dissolves sparingly in *alcohol*, readily in *ether*. (Blanchet.) — It dissolves in 500 pts. alcohol of sp. gr. 0.85 at 14° (Saussure), in 490 pts. of alcohol of sp. gr. 0.85 at 15°; more easily in absolute alcohol; the alcoholic solution is clouded by water, and yields crystalline laminæ when evaporated. (Herberger.)

It dissolves in volatile oils. (Herberger.)

81. Oil of Rosemary.

SAUSSURE. (1820.) Ann. Chim. Phys. 13, 278. KANE. Lond. Ed. Mag. J. 13, 437; J. pr. Chem. 15, 156; Ann. Pharm. 32, 284; abstr. Repert. 70, 161. ZELLER. Stud. über. äther. Oele, Landau, 1850. Volh. N. Br. Arch. 74, 16.

Rosmarinöl, Essence de rosmarin or romarin, Oleum Anthos.

Some to I Important. In Exempeious officinalis, L. — It is obtained by Landing the freed leaves and flowers with water.

Friedwal. Transparent of trivies: Saussure), yellowish to yellow. Letter St. 27 (1958 at 15%) received 0.556 (Saussure); 0.897; after received resudent in 0.5514 -0.5575 Kane., 0.88 -0.91. (Zeller. - Boung point 156 % in 155 Kane : of the fresh oil, below 100; of old the 152 Kane of the rectifed oil, 165% (Saussure.) - Tension of variour at 15% - 100% men of mercury. (Saussure.) It has a composition taste and sheels like the plant. It is neutral. (Zeller.) Turns the plane of polarisation of light to the right. (Lallemand.)

	Secret.	Kane.
	٤.	ð.
C	62-21	. 63-40
=	S-42 _	. 11.66
·	7.73	. 4.94
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The most varie of Spanish of freemary leaves on evaporation of frantiers. Freeze — 2.7 with other is leave to minimal. The most of N. Iv. 20, 2, 24.) — 3. With indirect becomes health that he state extracts with the alteration of odour. (Zeller)—It becomes beautiful to interest with a direct of odour. (Zeller)—It with surface to the state of the control with additional sufficiently to volatilise the indirect of a section of a section of a section of the direct of the control with additional becomes heated, and gives of the with attracts with a tracked to the control with firms a transfer of the with a section of the control of t

Combinations. Oil of rosemary at 29° absorbs 9.75 vol. ammoniagas. (Saussure.) — It dissolves in every proportion of alcohol of sp. gr. 0.85 (Zeller), at 18° in 40 pts. alcohol of sp. gr. 0.887. (Saussure.) — It

dissolves abundantly copal and caoutchouc.

¶ According to Lallemand (N. Ann. Chim. Phys. 57, 404), oil of rosemary may be separated by fractional distillation into two oils, one boiling at 165°, the other between 200° and 210°. - a. The former is a mobile hydrocarbon which turns the plane of polarisation to the left : it unites with hydrochloric acid, the combination being attended with rise of temperature, and forms a compound which remains liquid if left to itself, but, when treated with nitric acid, yields a considerable quantity of a crystalline hydrochlorate apparently identical with artificial camphor (p. 265). The same oil quickly absorbs moist oxygen in sunshine, forming crystals which are similar to those produced in like manner from all of temperature but discovery if subjected to the farther estion of from oil of turpentine, but disappear if subjected to the further action of oxygen, yielding a brown acid soluble in water.

b. The portion boiling between 200° and 210°, deposits at low temperatures a large quantity of camphor, resembling common camphor in all respects, excepting that it has rather less dextro-rotatory power. An additional quantity of it may be obtained by treating the mother-liquor with dilute nitric acid. ¶

Camphor of Marsh Wild Rosemary—see Ledum-camphor (p. 377).

82. Oil of Saffron.

ASCHOFF (1818.) Berl. Jahrb. 1818, 51. DEHNE. Crell. Chem. J. 3, 11. HENRY. J. Pharm. 7, 400. BOUILLON-LAGRANGE & VOGEL. Ann. Chim. 80, 195. QUADRAT. Wien. Akad. Ber. 6, 546; further, J. pr. Chem. 56, 68.

Safranöl, Essence de safron.

Source and Extraction. In saffron, the stigmata of Crocus sativus, L. - 1. Obtained by distillation with water. (Bouillon & Vogel, Quadrat.) - 2. Saffron distilled over a quick fire, with 8 pts. of saturated solution of common salt and 4 pts. of aqueous potash of sp. gr. 1.24, yields 9.4 p. c. of oil. (Henry.)

Properties. Yellow, mobile, heavier than water (Henry, Bouillon &

Vogel), lighter than water (Quadrat). Smells like saffron, and has a burning, sharp, rather bitter and caustic taste. (Henry, Bouillon &

Vogel.)

It gradually changes into a solid mass, which makes its appearance, even during the distillation of saffron with water (Bouillon, Dehne), and sinks in water. (Henry, Quadrat.) - Easily soluble in water. (Bouillon.)

83. Oil of Sage.

ILISCH. (1811.) A. Tr. 20, 2, 7. HERBERGER. Repert. 34, 131.
ROCHLEDER. Ann. Pharm. 44, 4; abstr. Repert. 79, 310. ZELLER. Stud. über äther. Oele, Landau, 1850.

Salveiöl, Salbeiol, Essence de sauge. Formation. By boiling oil of mustard with aqueous soda. (Hlasiwetz, Wien. Akad. Ber. 5, 189):

 $10 \, \text{C}^6 \text{H}^5 \text{CyS}^2 + 12 \, \text{NaO} = 4 \, \text{C}^{12} \text{H}^{10} \text{O} + 2 \, \text{C}^6 \text{H}^5 \text{NaO}^4 + 10 \, \text{NaCyS}^2$

Source and Extraction. In Salvia officinalis, L. - Obtained by dis-

tilling the fresh herb with water.

Properties. Greenish to brownish yellow (Zeller); from young plants: green, soon turning brown; from old plants in autumn: yellow (Cartheuser); distilled from oil 8 years old at 128°—130°, or from oil 2 years old at 150°: colourless; from the least volatile part of a two years old oil, by distillation with water: pale yellow. (Rochleder.)—Sp. gr. 0.864 (Ilisch); 0.86—0.92. (Zeller.)—Boils between 130° and 160° but not at a constant temperature. (Rochleder.)—Smells and 160°. but not at a constant temperature. (Rochleder.) Smells and tastes like the plant, when distilled from oil 8 years old oil at 128° to 130°; burning and camphorous, from oil 2 years old at 150°; disagreeably like rum. - Neutral. (Zeller.)

		Rochleder.					Hlasiwetz.		
	a.	144	b.		c.		d.		
C	80.25		77-97		78:33	****	80-64		80.63
H									
0	8.84		11.34	****	11.03	1100	8:41	Married .	7.67
	100-00		100:00	000	100-00		100:00		100.00

a. The first tenth, distilled at 135°, of a sample of sage-oil 8 years old, redistilled per se in the oil-bath between 128° and 130° till $\frac{3}{4}$ had passed over. — b. The distillate from 8 years old oil, between 130° and 140°, redistilled over chloride of calcium between 96° and 105°. — c. The distillate from 2 years old oil below 160°, distilled at 150° per se over chloride of calcium. — d. The product obtained by distilling with water at 130° — 145°, the least volatile of a 2 years old oil, rectified per se over chloride of calcium. — e. Prepared from oil of mustard. — Sage-oil is a mixture of several oils, of which a and d correspond to the formula $C^{12}H^{10}O$, b and c to the formula $C^{13}H^{10}O$. (Rochleder.) (Rochleder.)

1. Sage-oil when exposed to the air for some time, Decompositions. deposits camphor (Herberger), and becomes slightly acid. (Zeller.) - 2. The Spanish oil when evaporated, leaves 1/2 pt. camphor (Proust); German-oil becomes resinous without leaving camphor. (Ilisch.) -3. With iodine, it gives off yellowish red and grey vapours without fulmination, and forms a soft, extractive mass. (Zeller.) — It forms with iodine, without losing its odour, a thick magma easily soluble in the rest of the oil. (Guyot, J. Phys. 5, 230.) — 4. With cold concentrated mitric acid, or with weaker nitric acid, if warmed, it acquires a brown-red colour (Rochleder), reddish brown (Zeller), and deposits a red resin, with rise of temperature and brisk evolution of gas. — This resin consists of unaltered oil; a yellow resin soluble with red colour in aqueous potash; and nitrate of camphor, which, when distilled with water, yields a volatile oil having a peculiar odour, and a residual, yellowish red, brittle resin. — The mixture dropped into fuming nitric acid, becomes heated, gives off carbonic acid and nitric oxide, and forms common camphor. — On distilling the nitric acid solution of this mixture with 4 pts. of water, common camphor sublimes. (Rochleder.) — 5. Oil of vitriol colours it brownish red to crimson. (Zeller.) — 6. Distilled with hydrate of potash, it yields volatile oils, with evolution of hydrogen at last, then turns brown, and leaves carbonate of potash. — Sage-oil two years old distilled with a small quantity of hydrate of potash, yields — at first without evolution of gas — a colourless oil smelling of oil of turpentine (84·40 C, 11·87 H, 3·73 O), then another oil (83·17 C, 11·26 H, 5·57 O = C⁶⁶H⁵⁰O³), and at last, with evolution of hydrogen, an oil having a strong burning odour of sage and peppermint (76·87 p. c. C, 11·50 H, 9·83 O = C²²H²⁰O²); sage oil 8 years old, distilled after digestion at a gentle heat with a large quantity of hydrate of potash, yields a colourless oil having an empyreumatic odour (82·65 C, 12·52 H, 4·83 O = C²²H²⁰O) and leaves carbonate and hydrate of potash tinged with brown. (Rochleder) — 7. With bichromate of potash and sulphuric acid, it acquires a dark brown colour, afterwards becoming greenish. (Zeller.) — 8. Boiled with nitroprusside of copper, it yields a slate-grey deposit and acquires a darker colour. (Heppe, N. Br. Arch. 89, 57.)

It dissolves in every proportion of alcohol of sp. gr. 0.85. (Zeller.)

84. Sage-camphor.

This substance was found in sage-oil which had been kept for a long time in a badly-closed vessel, and was purified by pressure between slightly warmed filtering paper. — Yellowish white mass, lighter than water, melting at 31—37°, having an odour like that of turpentine-camphor and slightly like that of sage-oil, and a persistently sharp and bitterish cooling taste. Neutral. — When strongly heated, it swells up, diffusing a smoke which produces a scratching sensation in the throat, and a strong odour of turpentine-camphor, and yielding a slight sublimate. — When set on fire, it burns with a bright flame, leaving shining charcoal. — With nitric acid of sp. gr. 1·27, it becomes slightly heated, and yields a yellow resin but no oxalic acid. — With oil of vitriol it becomes brown-red and acquires a resinous consistence. — With hot hydrochloric acid, it forms a resinous mass. — With caustic alkalis, it forms a yellow-brown resin. — Sage-camphor dissolves in 450 pts. of cold and 300 pts. of hot water; the solution yields crystalline films when evaporated, but does not deposit crystals on cooling. — It dissolves without alteration in dilute sulphuric acid. — It dissolves in 5 pts. alcohol of sp. gr. 0·82, in all proportions of cther, easily in oil of turpentine, less easily in rock-oil, easily in fixed oils. (Herberger, Repert, 34. 131.)

85. Oil of Sweet Sedge.

TROMMSDORFF. (1809.) Ann. Chim. 81, 332; A. Tr. 18, 2, 122. SCHNEDERMANN. Ann. Pharm. 41, 374. Zeller. Stud. über äther. Oele, Landau, 1850.

Kalmusöl, Essence d'acore.

Source and Extraction. In the root-stocks of the sweet sedge, Acorus calamus, L. - The roots fresh or at least not too old, yield when comminuted and distilled with water, 1 p. c. of oil (Martius, Repert. 39, 240) _ 1.09 p. c. (Bley Repert. 48.96); dry roots a year old yield 1.36 p. c. fresh, slightly dried roots, 0.73 p. c. (van Hees, Pharm. Centrall. 1847, 380.)

Properties. Pale yellow to dark yellow (Trommsdorff, Martius); light brownish yellow (Bley); pale to reddish yellow and brown. (Zeller.) According to Schnedermann, the most volatile portion of the oil is colourless.

— Sp. gr. 0.899 at 25° (Trommsdorff), 0.89—0.94 (Zeller), 0.950—0.984. (van Hees.) — Boiling point 195° (after the most volatile portion has been distilled off). (Schnedermann. — Has a strong pungent odour, like that of the roots, and an aromatically bitter, burning, slightly camphorous taste. (Trommsdorff.) - Neutral. (Zeller.)

		Schr	nederm	ann.
		a.		b.
C		80.82		79.53
H		10.89		10.28
0	,	8.29		10.19
		100.00	Variable	100-00

a, distilled at 195°; b, at 260°. It is a mixture of several non-separable oils; the most volatile, containing 1½ p. c. oxygen, is in the pure state, most probably C**II**; the less volatile, boiling at 260°, is a mixture of resin and oil, the latter passing of when the mixture is heated, and the resin remaining. (Schnedermann.)

Decompositions. 1. It becomes darker in colour by exposure to light. (Trommsdorff.) — 2. When exposed to the air, it thickens and turns slightly acid, but does not yield any camphor. (Hasse, Crell. Ann. 1785, 1, 422.)—3. Gently heated with iodine, it gives off a small quantity of greyish yellow vapours without explosion, and is converted into a tough, reddish yellow-brown mass. (Zeller.) — It takes up 1.52 pts. of bromine, and acquires a blackish green colour. (Knop, Chem. Centralbl. 1854, 498.) — 5. With nitric acid, it acquires a yellowish redbrown colour, and is converted into a solid resin (Hasse), crumbling. (Zeller.) — With oil of vitriol, it resinises. — 7. Alcoholic potash turns it reddish yellow-brown. — 8. With bichromate of potash and sulphuric acid, it forms a dark brown, thickish, turbid mass. (Zeller.)

It dissolves without turbidity in absolute alcohol and in 1 pt. of

alcohol of sp. gr. 0.85.

86. Oil of Serpentaria.

In Virginian snake-root, Aristolochia Serpentaria, L. — It is obtained distilling the comminuted root with water. — The root contains 0.5 c. of oil. (Buchholz.) — Light brown; in single drops, brownish llow. Lighter than water. Smells and tastes like valerian and camor. (Grassmann, Repert. 35, 463.)

Neutral Oil of Spiraa, see Neutral Oil of Meadow-sweet (p. 382.)

87. Oil of Squill.

Meerzwiebelöl. — From Scillus maritimus, L. — Obtained by crushing ie fresh plant and distilling it with water. — Greenish yellow, viscid; is a disagreeable and persistent odour, sharp, but not so penetrating as tat of mustard-oil; produces burns on the skin. — Soluble in alcohol; ie solution irritates the skin. — The oil is different from that which is brained by distilling fermented squills with water. (Landerer, N. Br. rch. 95, 260.)

88. Oil of Syringa.

Unachtes Jasminöl.— In the flowers of the syringa, Philadelphus oronarius, L.—The flowers lose their odour when dry, and, on being distilled with vater, yield an squeous distillate having rather a repulsive than a pleasant odour, but equiring after some time an odour of roses.—To obtain the oil, the fresh lowers are exhausted with ether in a displacement apparatus; the upper athereal layer is separated from the lower gummy watery liquid; the other is carefully distilled off, and the residue is collected in a basin and filtered when cold. There then remains on the filter a yellow buttery mass, which loses its odour by washing with cold alcohol; and a watery liquid smelling strongly of the flowers runs off. The latter is shaken up with ether, and the ether is removed, shaken up with chloride of calcium, and left to evaporate.—Golden-yellow oil, having an intoxicating odour in the mass, fragrant in the dilute state. (Buchner, N. Br. Arch. 8170.)

Oil of Syringa vulgaris, see Oil of Lilac, p. 377.

9. Volatile Oil of Tagetes glandulosa.

Light yellow, strongly anthelmintic. (Fr. Eisenbeck, Br. Arch. 3, 421.)

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FL Of II Tea.

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2 was I I was more. It can the dried leaves of various species of The _ 1. A funited grammes of tea are directed for 48 hours with the forther the ether is then returned off, and distilled till only 8.4 the left the results is mixed with 1 on water; the mixture is distilled the property of the same and the tryer ethereal layer of the distillative experience from the lower and shiken up with chloride of calcium; at water the milky distillate, which has an intoxicating smell of texts. shaken up with other; the ethereal solution which fleats on the lywhen left at rest is dehydrated with chloride of calcium and distilled to small residue, and the other is left to evaporate spontaneously therefromio oil is obtained by repeatedly distilling the watery distillate over common at - In istilled with dilute sulphuric acid, vields a distillate having a faint odour, but so a

Properties. Lemon-yellow; lighter than water; solidifies easily when dd (because it contains camphor in solution); smells strongly of tea, and intoxicating that it acts like a narcotic; tastes of tea, but not astrinnt. - The oil prepared by the second method resinises quickly when posed to the air.

92. Oil of Wild Thyme.

(1830.) Repert. 34, 41. ERBERGER. ELLER. Stud. über. äther. Oele, Landau, 1850.

Quendelöl.

Source and Extraction. In wild thyme, Thymus Serphyllum, L.—btained by distilling the herb with water.—The aqueous distillate from old be contains acetic acid as well as oil. (Trommsdorff, N. Tr. 25, 2, 149.)—The eld of oil amounts 0.08 to 0.09 p. c.

Properties. Gold-yellow (Herberger); wine-yellow to brown. (Zeller.) gr. 0.89 to 0.91. (Zeller.) Has an agreeable odour of lemons and yme, and an aromatic bitter taste. (Herberger.)

Decompositions. 1. It is not decomposed by iodine in the cold, but hen heated with it to 75°, forms, without violent explosion, a mixture rich gives off iodine-vapours, takes fire, and after the combustion leaves resin. (Herberger.) It quickly evolves yellowish red vapours with line,—especially the oil obtained from the dried herb,—thickening at e same time and acquiring a reddish yellow-brown colour. (Zeller.)

2. With nitric acid, it acquires a dark yellow-brown colour, gives off s when heated, and leaves a soft resin. (Zeller.) Nitric acid of sp. gr.

28 does not act upon the oil at 22.5°, but when the mixture is heated the boiling point it explodes gives off nitrous acid and leaves a resin the boiling point, it explodes, gives off nitrous acid, and leaves a resin. lerberger.) - 3. With oil of vitriol, it acquires a dark brown-red colour d the thickness of a balsam. (Zeller.)—4. Strong hydrochloric acid es not act upon the oil below 75°; but at that temperature, it produces allition, the mixture becoming viscid on cooling, and appearing to be ixed with blackish green oil-drops. (Herberger.)—5. With bichromate potash and sulphuric acid, it assumes a greenish brown-yellow colour.

The oil dissolves in all proportions in alcohol of Combinations.

gr. 0.85. (Herberger, Zeller.)

93. Oil of Vitiveria.

In the root of a grass which grows in India. - The grass is cut up d distilled with water; the oil which passes over is collected; the ilky water which goes over towards the end of the distillation is hausted with ether, and the ether is left to evaporate spontaneously om the solution. — The more volatile portion of the oil is yellowish, ansparent, lighter than water; the less volatile is turbid, viscid, heavier than water, and sticks to the receiver. This latter is probably a mixtum of all and resin; on treating the oil with aqueous soda, the resin units with the soda, and may be separated from the solution by supermutation with nitric acid. (Cap. 1533, J. Pharm. 19, 48; Ann. Pharm. 7, 83.)

94. Oil of Fine-leaved Waterdrop.

In the seeks of Piellandrian aparticum, L. — They are bruised and desilbed with water yielding, according to Remler, 0.8 p. c. of oil. The plant distabled with § pla carbonate of potash. § pt. lime, and 6 pts. water, yields a milky, ammoniatal aqueous distillate having a strong taste and smells on the distillate there floats about 0.67 p. c. of oil. (Fricklander. — Fale vellow, lighter than water (Pfaff); viscid, heavier than water Rayhami J. Figure. 20, 453); when obtained by distilling the seed with potash it is brownish yellow, viscid, of sp. gr. 0.8526 at 18. (Fricklanger. Has a penetrating odour and a persistent aromatic tast, like that of the seed. Pfaff. Fricklanger.) Neutral. It does not entiate that it is excluded a sample and appropriate action of animals, unless administered in rather large quartities. Fricklanger, Report. 68. 1.)—It fulminates with iodine, giving of violet vapours and leaving a brittle resin. With furning nitric soil, it becomes that brown, then colourless and tenacious.

95. Cil of Water Horehound.

In the fresh herr of water horehound, Lyoppus Europeaus, L., where it is contacted by distribution with mater. — Green, buttery oil, while studies like the plant and has a sharp taste. (Geiger, 1823, Report 15, 2.)

Second Appendix.

Ferment Oils.

(.eisochiad q'a bequesi).)

From merical

These are volatile cills produced by the fermentation of various plants not or givally contained therein, and essentially different from the oils which are extracted from unfermented plants by distillation with water. According to Booker N. Fr. Arch. 55, 1611, they were known to the alchemists, and by them designated galaxiesences. The number of them known to exist has increased, since Buchner (Report, 53, 299) in 1833, first separated an oil of this nature from the fermented bett of Engineer Contains an Errs. by distillation.—Ferment-oils are for the most part much more soluble in water than ordinary volatile oils.

- According to Berzelius (Jahresber. 27, 541), they are perhaps peculiar alcohols, related to fusel-oil, and forming compound ethers with saltradicals and acids.
- 1. Ferment-oil of Chærophyllum sylvestre.—The flowering plant is left to ferment in water; the liquid distilled when the fermentation is ended; the distillate mixed with common salt, and shaken up with ether; and the ether removed from the aqueous solution and left to evaporate: the ferment-oil dissolved in it is then left behind.

 Brown, lighter than water, with a strong and peculiar pungent odour, and an aromatic taste, not bitter, but slightly scratching. Evaporates quickly even at 18°; burns when set on fire, with a clear, luminous flame, diffusing a vapour which excites coughing. Chlorine-luminous flame, diffusing a vapour which excites coughing. Chlorine-luminous flame, it is decomposed with violence by nitric acid. By oil of vitriol it is coloured brown, without losing its odour; the solution is rendered milky by water. It forms an emulsion with aqueous ammonia, dissolves sparingly in water, easily in alcohol, ether, and oils, both fixed and volatile. It dissolves resin. (Bley, N. Br. Arch. 45, 50.)
- 2. Ferment-oil of Chelidonium majus, L.—Obtained from the roots, in the same manner as the ferment-oil of Charophyllum sylvestre.— Lighter than water; has an agreeable odour like the bouquet of wine, and a persistent biting taste. It is not very volatile.—With iodine it forms a violet solution. With nitric acid it evolves nitrous gas, and with oil of vitriol it forms a slightly coloured solution, which is scarcely clouded by water.—It dissolves sparingly in water, readily in alcohol, ether, and oils, both fixed and volatile. (Bley, N. Br. Arch. 48, 156.)
- 3. Ferment-oil of Conium maculatum. Obtained from fresh hemlock in the same manner as the ferment-oil of Chwrophyllum sylvestre. Colourless; has a peculiar odour, not like that of hemlock, and a sharp burning taste; it is not poisonous. Dissolves with facility in alcohol, ether, and oils both fixed and volatile. (Landerer, Repert. 94, 237.)
- 4. Ferment-oil of Erythræa Centaurium, Pers. The plant, after maceration in water for 12 hours, gives off a perceptible odour, which increases up to 60 hours maceration and then ceases. (Büchner.) The aqueous distillate is pale yellow, with white turbidity; has a persistent enlivening, aromatic odour, which is not pleasant when close, and irritates the eyes and nose; its taste is excessively burning, like that of creosote, but not persistent. It reddens litmus, but not permanently (Büchner, Repert, 53, 303), and when heated with ammonia and nitrate of silver, reduces the solution to the metallic state. (Büchner.) To prepare the oil, fresh herb is macerated in water for 48 hours, the whole distilled, the odoriferous distillate redistilled, and this process continued as long as drops of oil pass over with the watery vapour. Thin greenish oil, having a peculiar, but not disagreeable, odour: it is not poisonous. (Büchner, Repert. 53, 299.)
- 5. Ferment-oil of Echium vulgare, L.—The plant in the flowering state is distilled with water after maceration; the distillate is shaken up with ether, and mixed with common salt; and the ether decanted therefrom is distilled off.—Pale yellow oil lighter than water, and smelling like other ferment-oils.—Easily soluble in alcohol and in ether. (Bley, N. Br. Arch. 30, 167.)

- 6. Ferment-oil of Erica vulgaris. The fresh herb is distilled after maceration with water; the distillate is cohobated and repeatedly distilled after addition of common salt, then shaken up with ether as long as the ether acquires any odour; and the ether is carefully distilled of from the dissolved oil. The oil obtained amounts to 0.023 per cent. Greenish yellow, mobile, lighter than water, with a peculiar odour, and a sweetish, aromatic, burning taste; reddens litmus. When st on fire, it burns with a clear, blue-edged flame, without leaving any residue. It is not deodorised by chlorine-water. It dissolves ioding without detonation. With fuming nitric acid, it froths up, and the solution mixed with water deposits resinous flakes. With oil of vitriol, it becomes darker, without losing its odour. (Bley, N. Br. Arci. 21, 302.)
- 7. Ferment-oil of Tussilago farfara, L.— The fresh bruised herb is macerated in water for 10 or 12 days, during which it turns light green and acquires the odour of pickled girkins; the whole is then distilled; the distillate, which has a vinous odour, is saturated with common salt and redistilled; this second distillate is shaken up with a large quantity of ether; and the ether is taken off and evaporated, the dissolved oil then remaining behind.—Yellowish, lighter than water, very volatile, with a peculiar, strongly aromatic, penetrating odour, and an aromatic taste, neither burning nor cooling.—It easily takes fire, and burns at first with a whitish, afterwards with a reddish, sooty flame.—It dissolves iodine abundantly, dissolves in oil of vitrid with yellowish colour, without losing its odour, and turns brown when heated with it.—With potash, it forms a whitish, soapy compound (Qy. Gm.).—It dissolves sparingly in water, readily in alcohol and ether. (Bley, Repert. 62, 406, N. Br. Arch. 13, 38.)
- 8. Ferment-oil of Marrubium vulgare, L. The comminuted here is soaked in water and exposed to the sun, whereby it acquires an offensive odour; the liquid is then distilled; the distillate saturated with common salt; the flocks thereby separated, are collected on a filter and dissolved in ether; and the ether is left to evaporate slowly.— The distillate saturated with common salt yields when heated, a second aqueous distillate, from which oil may be extracted by agitation with ether. Lighter than water; has a peculiar, sweet, etheral odour, and an aromatic, slightly biting taste. When set on fire, it burns with flame, without leaving charcoal. It dissolves in distracted with oil of vitriol, it becomes heated and acquires a peculiar odour. With chlorine-water, it emits an odour of roses and forms a film of resin. It dissolves in aqueous alkali and in water. (Bley, N. Br. Arch. 10, 67.)
- 9. Ferment-oil of Achillea Millefolium, L.—The fresh flowering plant is macerated in water and left to ferment; the whole is distilled, with cohobation; the blue oil which floats on the distillate is removed; the residual water, after addition of common salt, is agitated with ether; and the ether which separates is left to evaporate. Yellow-brown oil, having a slightly aromatic odour, and an aromatically bitterish, rather sharp taste. It dissolves in alcohol, ether, and oils, both fixed and volatile. (Bley, N. Br. Arch. 30, 167.)

- 10. Ferment-oil of various species of Plantago. Obtained from plantain-leaves by fermentation, distillation, and agitation of the distillate with ether, in the same manner as the ferment-oil of Achillea Millefolium. Yellow, transparent; has an ethereal odour slightly resembling that of mustard-oil, and an aromatic, sweet, burning taste. Very volatile. With fuming nitric acid, it turns brown, with rise of temperature and intumescence; the solution first becomes greenish yellow, with milky turbidity, then clear, smells like artificial musk, and has a disgustingly bitter taste. With oil of vitriol, it forms a dark brown-red mixture, from which water separates resinous flocks smelling of resin and ferment-oil. It dissolves in alcohol, ether, and oils. (Bley, N. Br. Arch. 40, 130.)
- 11. Ferment-oil of Quercus Robur, Willd. Obtained from fresh oak-leaves by fermentation, distillation, and treatment of the distillate with ether, in the same manner as the ferment-oil of Achillea Millefolium. Pale green; sp. gr. 0.695, has an agreeably enlivening odour, a sweet, burning taste, and reddens litmus. It is easily inflammable, and burns, with penetrating odour, and with a first bluish, then whitish, non-fuliginous flame. With fuming nitric acid it froths up and becomes very hot, but does not lose its odour. With oil of vitriol, it becomes hot and assumes a dark red-brown colour. It dissolves sparingly in water, readily in alcohol, ether, and oils, both fixed and volatile. (Bley, N. Br. Arch. 26, 48.)
- 12. Ferment-oil of Salix pentandra, L. Obtained from fresh willow-leaves in the same manner as the ferment-oil of Achillea Millefolium. Yellow, lighter than water; has an aromatic odour, like that of castoreum, and at the same time like that of willow-leaves; reddens litmus. Smells strongly when heated, and burns, when set on fire, with a very smoky flame, leaving a small quantity of charcoal. Dissolves iodine abundantly. With fuming nitric acid, it froths up and thickens, but does not take fire, and if water be then added, deposits light yellow, bitter, resinous flocks. With oil of vitriol, it becomes slightly warm, brown, and viseid, and on subsequent addition of water, deposits resinous flocks smelling of the ferment-oil. It dissolves sparingly in water, easily and in all proportions in alcohol, ether, volatile and fixed oils, and creosote. (Bley, N. Br. Arch. 40, 129.)
- 13. Ferment-oil of Salvia pratensis, L. Obtained from the fresh herb, like the ferment-oil of Achillea Millefolium. Dark red-brown, with a repulsive, ethereal, sweetish odour, and an aromatic taste. It dissolves sparingly in water, easily, and in all proportions, in alcohol, ether, and oils, both fixed and volatile. It forms a liniment with aqueous ammonia, and is very sparingly dissolved by aqueous potash. (Bley, N. Br. Arch. 51, 257.)
- 14. Ferment-oil of Trifolium fibrinum, L. Obtained like the ferment-oil of Achillea Millefolium, from the dried plant, even after it has been well boiled with water and no longer has a bitter smell, by fermentation, distillation, saturating the distillate with common salt, and shaking it up with ether.—Pale yellow, lighter than water, smells strongly aromatic, like the ferment-oil of Tussilago farfara; its taste is at first burning and sweetish, afterwards aromatic. When set on fire, it burns with a blue, slightly fuliginous flame, giving off

strang-smelling various which excite coughing, and leaves a small maintain it dissolves sparingly in water, easily in alcohol and sales. Bier, Julian p. Pierra, 2, 207.)

- If Fr now-1 of Tokes weres, L Obtained like the ferment-oil of Links in 18. It is a state that a sharp and intoxicating odour. Resembles the ferment-11 of Erican religion. (Bley, N. Br. Arch. 30, 167.)
- If Formers of Two eviden. L.—Fermented vine-leaves are discipled the inclinate is criticated and shaken up with other; the ethereal solution is list lied; and the othereal, peculiar-smelling discipling is received in the ferment off dissolved in it then remains behind. The vellow brinter than water; has a peculiar vinous odour, like wheely were and minimisette, and a burning, sweetish, aromatic taste. It replies himse slightly bit permanently. It evaporates in the air, diffusing a strong office. Heated with fuming nitric acid, it remines an instances a grass-reset collin. With oil of vitriol, it forms first a white, them a lightered and ultimately a brown mixture, without declarised by agitation with chlorine-mate. With present social, it firms a clear mixture, from which the oil afterwards separates with relativism colour, but with its original odour. It dissolves startingly in water, without alteration in hydrochloric and acids cost. With reliable of protest, it forms a milky liquid, from which it afterwards separates makered; with carbonate of potash, a liniment from which it also separates makered; with aqueous ammonia, a complete

mixture. It dissilves abundantly in alouhol, other, and fixed oils; in call of there exists and oil of leaves, it forms at first a milky solution, which afterwards becomes clear. (Bley. Report. 68, 301.)

An oil different from that just described, may be obtained from wint, by leaving it to freeze, distilling off the volatile part of the remaining liquid, and shaking up the residue with other. (Bley.)

in cellulistasis a disease of the apple, which imparts a musky odor to that from It is climined from the diseased apples by distillation with water. Yellowish grey, lighter than water; boils at 10%. Smells of musk, tastes rough and sharp. Contains 64:15 p. c. C. 2065 H. 15:15 O. and 0:05 N. It volatilises completely when heated, and hums when set on fire, with a feetle flame, diffusing a small quantity of smake. Oh has decomposes it, with elimination of hydrochlora acid. With dry hydrochloric acid out it forms a crystalline compound of the first ite matches. It dissolves readily in alcohol and other, and imparts a musk-like odour to souter. (Rossignon, J. Pharm. 27, 158; J. pr. Clem. 23, 388; Ann. Pharm. 39, 121.)

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Oxygen-nucleus C20H14O2.

Thymol.

C20H14O2.

A. E. ARPPE. (1846.) Ann. Pharm. 58, 42; abstr. Berz. Jahresber. 27, 451.

DOVERI. N. Ann. Chim. Phys. 20, 174; Ann. Pharm. 64, 374; Compt.

rend. 24, 390.

A. Lallemand. Compt. rend. 37, 498; J. pr. Chem. 60, 431; Pharm. Centralbl. 1853, 754. — Compt. rend. 38, 1022; J. pr. Chem. 62, 295; Pharm. Centr. 1854, 513. Report. by Dumas & Bussy, Compt. rend. 39, 723. - Compt. rend. 43, 375. Report, 43, 459. - Abstract of the preceding Memoirs; Ann. Pharm. 101, 122. - Fully, and with Emendations, N. Ann. Chim. Phys. 49, 148; abstr. Ann. Pharm. 102, 119.

Stenhouse. Ann. Pharm. 93, 269; 98, 307. R. Haines. Chem. Soc. Qu. J. 8, 289; J. pr. Chem. 68, 430; Chem. Centralbl. 1856, 593.

Thymian-campher. Ajwakaphul of the Hindoos. - First observed by Neumann Thymian-campher. Asteakaphul of the Hindoos. — First observed by Neumann (Chymia medica, 21, 282), Brown & Forcke (N. Br. Arch. 17, 178), investigated by Doveri and Lallemand. The stearoptene of monarda-oil examined by Arppe, was recognised by Gerhardt, (Traité, 3, 610) and by Stenhouse, as identical with thymol. The (partly differing) statements of Stenhouse relate to the camphor or stearoptene of Ptychotis-oil, which has not yet been completely proved to be identical with thymol, and has been twice investigated by Stenhouse, with varying results.

Source. In oil of thyme. — In the volatile oil obtained from the seed of Ptychotis (Arppe). In the volatile oil obtained from the seed of Ptychotis, (Stenhouse, Haines.)

Formation. By the oxidation of thymene or cymene. A mixture of thymene and cymene through which 1500 litres of dry air were passed for four months, became viscid and dark red, and yielded to caustic alkali a large quantity of thymol. (Lallemand.)

Preparation. a. Of crude Oil of Thyme. - Bruised thyme is distilled

Preparation. a. Of crude Oil of Thyme. — Bruised thyme is distilled with water in a large still. —1 lb. of the dry herb yields on the average 38 grains; I lb. of the fresh herb, 45.7 grains. (Zeller, N. Jahrb. Pharm. 2, 78.) — By repeatedly distilling the seeds of Ptychotis Ajowan with water, a volatile oil is obtained amounting to 5 or 6 p. c. of the seeds, having a light brown colour, an agreeable aromatic edour, and 3p. gr. = 0.896 at 12°. (Stenhouse.)

b. Preparation of Thymol. — Oil of thyme is subjected to fractional distillation, whereupon it begins to boil at 150°, and if the boiling point be raised quickly to 175°, then slowly to 180°, thymene and cymene pass over together. While the temperature of the liquid rises quickly from 180° to 230°, a mixture of thymene and thymol passes over; then between 230° and 235°, thymol, which must be collected apart. (Doveri.) By this process, only an imperfect separation of the two constituents is effected, the distillate obtained below 225°, still containing a considerable quantity of thymol; this below 225°, still containing a considerable quantity of thymol; this

distillate is therefore shahen up with strong socially to dissolve the flowed, and the loguid is separated from the undissolved thymne, which flows on the surface, and mixed with dilute hydrochloric and which presuptates the thymol. After this parties of thymol his solidified, and the distillate which passed over between 230° and 235° his been caused to solidify by the introduction of a few crystals of thymol, the whole of the crystals are repeatedly pressed between biblions paper and recognitioned from alcohol. (Lallemand.) — Arppe presses between filtering paper the thymol which separates from monarda-oil on standing, and district a either per se or with water. — Stenbouse leaves the oil of Physiothe Agonesa to evaporate spontaneously, whereupon thymogradically crystallises out at low temperatures; or subjects the oil to be the solid from the solid first and 222°, beings it to the solidifying point by agitation or by immerical at a fragmental maximum, undersystallises it from thymene or from alcohol. However, and trying the propose the solidification of the later by introducing a crystal of flaymol.

Presented. Thin, rescaling tables, probably belonging to the right prismatic system. (Arppe.) Angles 82° 30′ and 97° 30′, with cleaver parallel to the edges of the tables. (Arppe.) Miller, in Stenhous's Memoir (Ann. Pharm. 33, 269), describes the $\frac{1}{4}$ " long crystals a belonging to the oblique prismatic system. In a later Memoir by Stenhouse (Ann. Pharm. 98, 310), two crystalline forms of thymol and described as determined by Miller. From the crude oil, thymol crystallines in the rhombohedral system. (Fig. 143.) Rhombohedrons, laving the terminal edges replaced by c-faces. Moreover the middle edge of the rhombohedron r':r', r':r', &c., are truncated by a six-added prim (* in Fig. 145.). The faces c and s are very narrow, s: s = 120°; r: = 130° 33°; r: r = 81° 22°; r: a = 139° 19°. From alcohol it crystallines in forms belonging to the oblique prismatic system. Thin rhombotables (somewhat like Fig. 112), having their edges bevelled by the unequally inclined faces n and h, and their acute summits bevelled by the unequally inclined faces t and f; the four-edged summits of h and a are replaced by a pair of m-faces; -f, i, m are hexaïd-faces; u and a posterior angite-pair; t, a posterior oblique terminal face; h and h the second pair; m: i = 90°; t: f = 76° 37°; f: m = 90°; t: f = 131° 41°; h: i = 118° 54°; h: h = 130° 38°; h: m = 139° 21°; h: i = 81° 20°; n: i = 130° 42°; u: h = 130° 38°; t: h = 118° 49°; u: t = 137° 47°; h: h = 98° 42°. In the crystals separated from the oil, the directions of cleavage are parallel to the rhombohedral faces r, and therefore interect one another at angles of 81° 22′; the crystals separated from alcohol cleave parallel to the rhombohedral faces r, and therefore interect one another at angles of 81° 22′; the crystals separated from alcohol cleave parallel to the rhombohedral faces r, and therefore interect one another at angles of 81° 22′; the crystals separated from alcohol cleave parallel to the rhombohedral faces r, and therefore interect one another at angles of 81° 22′;

Thymol in the solid state is somewhat heavier than water; in the liquid state lighter. (Lallemand.) Sp. gr. 0.932 at 25.62 (Haines), of the solid thymol, 1.0285 (Stenhouse). It melts at 44 (Lallemand.) Stenhouse), at 48° (Arppe), at 52.7° (Haines), forming a colouries of which may remain liquid for a long time at ordinary temperatures, but solidifies when a crystal of thymol is thrown into it (Lallemand) or when it is cooled or shaken (Stenhouse), the temperature then remaining stationary at 44°. After being melted, it solidifies at 38°; but if it be heated sowhat above its melting point, the solidifying point falls, so that after heating to 10°.

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105°, 140°, and 170°, solidification takes place at 34°, 33°, 31½°, and 31°, the temperature of the thymol rising at the same time to 38°, 37°, 35½°, and 35°. (Arppe.) It solidifies after distillation per se (Arppe), or after the decomposition of its potash-solution by hydrochloric acid (Lallemand), immediately on cooling. It appears to volatilise at ordinary temperatures. (Miller.) Thymol boils at 220° (Arppe), at 222° (Stenhouse), at 230° (Doveri, Lallemand). It does not deflect the plane of polarised light. (Lallemand.) Smells like thyme (Arppe, Haines), has a strong peculiar odour (Stenhouse), faint, different from that of thyme-oil (Lallemand). Its taste is sharp and burning (Arppe), pungent and aromatic (Lallemand). Neutral to vegetable colours. (Lallemand, Stenhouse.) It has an acid reaction. (Doveri). Vapour-density at 275° = 5.53 (Doveri), 5.42 (Lallemand).

					Arppe.		Doveri.	L	allemand.
20 C	120	1	80.00	********	78.88	Vin	78.7		79.94
14 H				-	9.42	1000	10.0		9.46
2 0					11.70	on	11.3	****	10.60
C20H14O2	150		100-00		100.00		100-0		100.00
	Stenhouse	e.	Haines.						
	mean.		mean.				Vol		Density.
C	79.73		79.59	C-va	pour		20		8.3200
H	9.24		9.55	H-ga	is		14		2 2 2 2 2 2
0	11.03		10.86		is			***	7.1000
			100.00	-	mol-vapo				10.3995

Arppe examined thymol from oil of monarda. Doveri and Lallemand, that from oil of thymene; Stenhouse and Haines that from the oil of Ptychotis Ajowan. Stenhouse formerly examined crystals from Ptychotis-oil, which contained 69 17 p.c. C, and 9 51 H (C44H34O10 = 69 84 C and 8 99 H, Stenhouse), and formed a peculiar compound with chlorine (p. 442); but he afterwards regarded these crystals as identical with thymol from Ptychotis.

Isomeric with cuminic alcohol, carvol, and carvacrol.

1. Thymol is somewhat altered by repeated dis-Decompositions. tillation, the liquid which passes over containing less carbon. (Stenhouse.) It decomposes when heated considerably above its boiling point, and consequently the determination of its vapour-density comes out too high. — 2. When mixed with anhydrous phosphoric acid, it becomes hot, assumes a wine-red colour, and forms a syrup which yields oil by distillation. On rectifying the distillate once or twice over anhydrous phosphoric acid, then with water, a light, colourless, mobile oil is obtained, which boils at 175°, contains 84°1 p. c. C and 10°15 H (whence Doveri deduces the formula C²⁰H¹⁴O, requiring 84°5 C and 9°8 H), and, after being again repeatedly rectified over anhydrous phosphoric acid, finally yields a hydrocarbon which boils at 180°, contains 89°2 p. c. C and 10°0 H, and is therefore perhaps C²⁰H¹³, this formula requiring 90°3 C and 9°7 H. (Doveri.) By the action of anhydrous phosphoric acid, thymol is converted into a green substance, which dissolves in alcohol, and is precipitated from the solution by water as a thick, dark green, acid liquid, but cannot be crystallised either alone or in combination with potash. (Stenhouse.) - 3. By oil of vitriol, at 50° - 60°, it is converted into sulphothymic acid; heated with excess of oil of vitriol to 240°, it yields sulphodraconic acid. (Lallemand.) - 4. Chlorine in diffused daylight acts with great violence on thymol, with rise of temperature, and

climination of hydrochloric acid gas, the thymol remaining liquid and assuming a wine-red colour at the beginning of the action. If too great heat be avoided, the product consists of terchlorothymol (which, when the quantity of chlorine absorbed amounts to 3 the weight of the thymol, sometimes separates in needles); then, if the passage of the chlorine be sometimes separates in needles); then, if the passage of the chlorine be continued in bright daylight, a very viscid oil is formed from which quintichlorthymol gradually crystallises. (Lallemand.) Thymol from ptychotis-oil absorbs chlorine quickly, becomes hot, and forms a peculiar chlorine-compound (p. 442), then, when more chlorine is passed through it, an uncrystallisable resin. (Stenhouse.) Oil of thyme, distilled with 8 pts. chloride of lime and 24 pts. water, yields chloroform. (Chautard, Compt. rend. 34, 485; J. pr. Chem. 56, 238.) — 5. Bromine, in sunshine, converts thymol into white, solid, earthy quintibromthymol, which melts at a stronger heat, decomposing at the same time and giving off hydrobromic acid, and may be crystallised from ather. (Lallemand). On the passage of the chloride of be crystallised from ether. (Lallemand.) On thymol from ptychotis-oil bromine acts quickly, forming an uncrystallisable substance. (Stenhouse.) — 6. Thymol is not altered by hydrochloric acid. (Stenhouse.) When hydrochloric acid gas is passed over thymol, it quickly assumes a brown and, after removal of the excess of hydrochloric acid, a purple-brown colour, but does not increase in weight by more than 2 to 3 p. c. even when heated; on distilling the product, unaltered thymol is first obtained, then a red substance. The latter turns blue when treated with alkalis in the cold, then a red substance. The latter turns blue when treated with alkalis in the cold, green when heated therewith, and recovers its red colour by exposure to the air. It dissolves with blue colour in baryta-water, and may be precipitated from this solution by carbonic acid, together with carbonate of baryta, then extracted from the precipitate by alcohol, and remains, after the evaporation of the alcohol, as an amorphous, dark violet, chlorinated mass, which may be distilled and forms red vapours when heated. (Arppe.) — 7. Thymol is violently attacked by nitric acid, giving off nitrous and carbonic acid gases, and forming a soft, brown-yellow, offensive-smelling resin (Doveri), and a large quantity of oxalic acid. (Lallemand.) Nitric acid slowly dissolves thymol, and forms a peculiar, colourless, crystalligable, acid, which does not form ablercation when colourless, crystallisable acid, which does not form chloropicrin when heated with chloride of lime. (Stenhouse.) Respecting the formation of binitrothymol, see page 419.—8. Thymol is decomposed by boiling with strong acids or alkalis. (Stenhouse, vide inf.)—9. Aqueous sulphothymic acid (the solution of thymol in oil of vitrio, according to Stenhouse), becomes heated by contact with peroxide of management of higher acid and wields a distillate of thymol bichromate of potash and sulphuric acid, and yields a distillate of thymol and aqueous formic acid, whilst a brown acid remains, which is solid and friable at mean temperature, and dissolves in alcohol with dark-red colour. (Lallemand.) — 10. Thymol dissolves in glacial acetic acid, and on subsequent addition of oil of vitriol, forms sulphacetothymic acid. (Lallemand.)

Combinations. Thymol dissolves in about 333 pts. of water. (Lallemand.) It is not altered by aqueous ammonia, but takes up a large quantity of gaseous ammonia, and resolidifies after the ammonia has escaped. (Lallemand.) Oil of thyme digested with aqueous ammonia, first turns yellow, then red, then dark brown. (Lewis, Alm. 1780, 32.)

yellow, then red, then dark brown. (Lewis, Alm. 1780, 32.)

Thymol dissolves in aqueous alkalis and combines with them. (Lallemand.) Thymol from ptychotis-oil is liquefied by aqueous alkalis, but does not dissolve in them. (Stenhouse.) The compounds are decomposed by the carbonic acid of the air or by aqueous alkalis, with separation of thymol.

Thymol-soda. — When thymol in the state of vapour is passed over soda-lime heated to dull redness, no gas is evolved, but a crystallisable

substance is formed, which has the composition C²⁰H¹³NaO², melts when heated, and, when dissolved in water, precipitates the solutions of mercuric nitrate and nitrate of silver. The mercury-compound is greyish violet, is not decomposed at mean temperature by dilute sulphuric acid or nitric acid, but is decomposed by hydrochloric acid, with separation of thymol, and, after prolonged washing with acetic acid and alcohol, contains 56.8 p. c. mercury, and is therefore C²⁰H¹³HgO²,HgO (calculation = 56.07 Hg). (Lallemand.) Alcoholic thymol does not precipitate alcoholic solution of neutral acetate of lead. It does not precipitate nitrate of silver, even after addition of ammonia. (Stephouse.)

nitrate of silver, even after addition of ammonia. (Stenhouse.)

Thymol dissolves very readily in alcohol, ether, and glacial acetic acid.
(Lallemand.) It is precipitated from the alcoholic sotution by water in

drops, according to Stenhouse, not at all according to Lallemand.

Oil of Myrrh.

C20H14O2

RUICKHOLDT. N. Br. Arch. 41, 10.

The volatile oil of myrrh, the gum-resin of Balsamodendron Myrrha and B. Kalaf. The alcoholic extract of myrrh yields by distillation a quantity of the oil amounting to 2.2 p. c. of the myrrh. Bley & Diesel (N. Br. Arch. 43, 304), by distilling myrrh with water, obtained 1.6 to 3.1 p. c. of volatile oil, the quantity being smallest from myrrh which had an acid reaction, and the watery distillate then containing formic acid; this acid is likewise produced, together with a soft resin, when oil of myrrh oxidates in contact with air and water. Pfaff (Mater med.?) mentions a volatile oil of myrrh heavier than water and not distillable therewith. Brandes (Almanach, 1819, 125) describes a mobile, colourless oil of myrrh, likewise heavier than water, and distillable with water but not with alcohol. The lastmentioned oil resinises when exposed to the air, and forms with nitric acid a turbid mixture, with oil of vitriol a dark red mixture, from which water throws down white flocks. It dissolves in alcohol, ether, and fixed oils, and is extracted from the ethereal solution by hydrochloric acid, imparting to that liquid a dark purple-red colour.—Braconnot (J. Pharm. 15, 288; Repert. 34, 398) obtained from (perhaps impure) myrrh, 3 p. c. of a pale yellow, volatile oil, which turned red when mixed with an equal quantity of cold nitric acid, dissolved in 2—3 pts. of alcohol or glacial acetic acid, readily in ether.

Properties. Light wine-yellow, viscid oil, having the taste and smell of myrrh, lighter than water and heavier than alcohol. It has an acid reaction and becomes viscid and darker-coloured by exposure to the air.

				R	wickhold mean.
20 C 14 H 2 O	14	****	9:33		79·34 10·16 10·50
C20H14O2	150	****	100-00		100.00

Ruickholdt gives the formula C²²H¹⁶⁴O²; Heldt, (Ann. Pharm. 63, 59) gives C⁴⁴H²²O⁴; but Ruickholdt's analyses when recalculated, one of them giving 9.88 p. c. H, agree better with the above formula (Kr.)

Oil of myrrh is soluble in alcohol and in ether.

Carvol. C20H14O3.

Völkel. (1840.) Ann. Pharm. 305, 308; Ann. Pharm. 85, 246; abstr. J. pr. Chem. 60, 120.

Schweizer. J. pr. Chem. 24, 257.

VARRENTRAPP. Liebig, Poggendorff & Wöhler, Handworterb. d. Chem. 4, 686.

Source. In oil of caraway, together with carvene (p. 283). (Völkel.)

Preparation. The portion of oil of caraway which passes over between 225° and 230° is separated by repeated fractional distillation. (Völkel.) When hydrosulphate of carvol is digested with dilute alcoholic potashand the filtrate is treated with water, carvol separates out, and may be dried and rectified with chloride of calcium; it then passes over at 250°. (Varrentrapp.)

Properties. Transparent, colourless, mobile. Sp. gr. 0.953 at 15°. (Völkel.) Boiling point above 250°. (Varrentrapp.) Smells like carvene. (Völkel.)

					Völkel.	V	arrentrapp.
20 C	120	****	80.00	*******	80-17	****	79.80
14 H	14	-	9.33	******	9.47	****	9.31
2 0	16		10.67	-	10.36	****	10.89
C50H14O2	150	****	100.00	*******	100-00	****	100.00

According to Völkel, it is C³⁰H³⁰O³, and therefore = carvene (C³⁰H³⁰) minus 3 At. H and plus 3 At. O. Isomeric with cuminic alcohol, thymol and carvacrol.

Decompositions. 1. Carvol when heated appears to be transformed into carvacrol, and yields by distillation a strongly coloured, viscid oil. (Völkel.)—2. By nitric acid and oil of vitriol, it is violently attacked and resinised.—3. By distillation with glacial phosphoric acid, it is converted into carvacrol.—4. It likewise yields carvacrol when distilled with hydrate of potash. (Schweizer.)—5. With alcoholic hydrosulphate of ammonia, it forms hydrosulphate of carvacrol. (Varrentrapp.)—6. When hydrochloric acid and air are passed successively through carvol, hydrochlorate of carvol is formed, which contains 18.79 p. c. HCl, and is therefore C²⁰H¹⁴O², HCl (calculation 19.55 p. c. HCl). (Varrentrapp.)

therefore C²⁰H¹⁴O², HCl (calculation 19.55 p. c. HCl). (Varrentrapp.)

Carvol absorbs hydrocyanic acid abundantly, and gives it off again
completely when air is passed through it for some time. (Varrentrapp.)

Carvacrol, C20H14O2.

Schweizer. J. pr. Chem. 24, 271; further, 26, 118. Claus. J. pr. Chem. 25, 266.

Camphokreosot. (Claus.)

Formation. Together with carvene, when oil of caraway is distilled with glacial phosphoric acid; together with resin, when the same oil is

distilled with pulverised hydrate of potash; and with evolution of hydrogen, when it is distilled with potassium; also, mixed with carvene, when oil of caraway is repeatedly distilled with iodine, as long as hydriodic acid is evolved, and the distillate then decomposed by aqueous potash. (Schweizer.) — Produced also by distilling camphor with an equal weight of iodine, the other products of the reaction being camphin, colophene, and camphoresin (Claus); also by heating carvol with fused phosphoric acid or pulverised hydrate of potash. (Völkel, J. pr. Chem. 30, 376.) — By distilling oil of thuja with iodine, being then accompanied by thujone and colophene;—or, together with resin, by distilling the same oil with pulverised hydrate of potash. (Schweizer, J. pr. Chem. 30, 376.)

Preparation. 1. Oil of caraway is distilled over glacial phosphoric acid, till all the carvene has passed over and the difficultly volatile oil which remains is decanted from the hydrated phosphoric acid and distilled per se. — 2. Oil of caraway is distilled with pulverised hydrate of potash, carvene then passing over; the residue is dissolved in water, poured off from the resin which separates, and mixed with dilute sulphuric acid; and the thick mixture of resin and carvacrol which separates is distilled per se. (Schweizer.) — 3. Common camphor is distilled with an equal weight of iodine, whereupon camphin first passes over, and when the residue is more strongly heated, a distillate mixed with colophene is obtained. This distillate is dissolved in potash-ley and separated from the solution by an acid; and the resulting oil is distilled over lime. (Claus.)

Properties. Transparent, colourless or yellowish, viscid oil. Heavier than water (Schweizer), lighter than water. (Claus.) — Boiling point almost exactly 232°. (Schweizer.) — Has an odour like that of creosote (Völkel, Claus); peculiarly disagreeable; the vapour is pungent and excites coughing; the taste is persistent, strong and hiting (Schweizer), like that of creosote, sweetish at first, afterwards scratching. (Claus.)

					Schweize	r.
	20 C			80.00	 a. 80.73	b. 80.35
1	14 H 2 O	14 16	****	9.33	9.66	
	C20H14O2	150	****	100.00	 100:00	. 100-00

a, prepared with phosphoric acid; b with hydrate of potash. Its formula is $C^{40}H^{20}O^3$ (Schweizer); it is carvol $(C^{30}H^{21}O^3) \longrightarrow HO = C^{30}H^{20}O^2$ (Völkel); isomeric with thymol (Cahours, Gerhardt, Traité, 3, 615.) Claus's campho-creosote is identical with carvacrol. (Schweizer.)

Decompositions. 1. Carvacrol when set on fire burns with a bright, very smoky flame.—2. With nitric acid, it forms, with evolution of nitrous acid, a yellow resin (which is more soluble in water than the resin obtained with carvene (p. 284); its alcoholic solution produces deep reddish yellow stains, and is not precipitated by neutral acetate of lead.—3. Heated with potassium, it gives off hydrogen, becomes dark brown, more viscid, and finally hard, and, if water be then added, carvacrol separates, contaminated with a small quantity of a brown resin insoluble in aqueous potash.

first asked to the solution, separate an additional quantity of carvand and a resit soluble in person. These reside are produced by the action of the residence produce of potasis on the current. — 4. With Applicate of potasis, it secures warm and immediately assumes a dark brown colour, thicken when heared, and on addition of water, deposits a resin insoluble is milities in pattern buy — Both these mains are identical with those which are proyou becoming more mobile and red-known, but gives off all the amount when hented, leaving a quantity of red-lower resin.

Situation comment does not precipitate neutral occiute of lead. (Schweize.) It Carvacrol is somewhat soluble in water, and dissulves with famility in aqueous potast, in alcohol, and in other.

Appendix to Carvol.

Crude Oil of Caraway.

The walnule oil obtained by distilling with water the seeds of Caron Corm, is a minimum of enryene (p. 283) and carvol. (Schweizer, Völkel)

— Dry seeds yield 437 p. c. (Trommsdorff), 4:17 (Martius, Repet. 33, 242), 3:12 (Rayhand), 5:12 (Hopff, Jakrb. pr. Pharm. 12:99), 4 p. t.;
Sanon seeds, 3 p. c. (van Hees, Pharm. Centr. 1847, 380.) It editain the whole of the oil, the caraway-seeds must be distilled with

water several times. (Martius.)

Crude oil of caraway varies from pale-yellow to colourless; it is mobile, of sp. gr. 0-94 (Lewis), 0-238 (Volkel), 0-913-0-926 (van Hon). 0-91 to 0-97. (Zeiler.) It begins to boil at 175°, giving off chiefy curvene at first, then curved, as the temperature rises to 232°, and leavesa slight viscid residue. (Volkel.) According to Bizio (Brugu. Gira 19, 380), it solidities partially on cooling. Smells of caraway, and has barning, sharply bitterish taste, less powerful than that of the fint pertion of the distillate. (Schweizer.) According to Völkel, it contains from 88-10 to 76-80 p. c. carbon and 11-09 to 9-22 p. c. hydrogo, according as it consists in greater part of carvene or of carvol. Similar results were obtained by Schweiner, J. pr. Chem. 24, 257; Ann. Plara. 40, 229; Eer, sriest 8, 195.)

By exposure to light and our, it becomes darker: the same change takes place spontaneously by keeping, in consequence of the formation of a volutile substance (which may be separated by heating the altered oil with half is volume of aqueous potash, precipitating the oil with water, and distilling. (Völkel) - Every time that the crude oil is distilled, there remains, according to Völkel, a thick coloured residue (probably from partial decomposition of the carvol), or, according to Schweizer, a reddish yellow, brittle resistable in absolute alcohol and ether, and containing 75-15 p. c. C. 8-98 H, and 25-87 O. - It dissolves when heated, a mixture of sulphar and phosphorus, forming an offensive-smelling oil volatile after boiling with potash, and probably also spontaneously inflammable phosphoretted hydrogen. (Schweizer.) - It dissolves iodine with dark brown red colour, rise of temperature and slight detonation (Flaschhoff, Br. Arch. 33, 215).

becoming thick and resinous. (Winckler, Repert. 33, 185.) When the dark brown solution of iodine in oil of caraway is repeatedly distilled, it gives off hydriodic acid, assumes first a yellow, afterwards on cooling, a red colour, and, if then distilled, yields carvene and a residue of carvacrol. (Schweizer.) — Only old oil of caraway becomes hot and detonates with iodine. (Zeller, Stud. über. üther. Oele, Landau, 1850.).— With fuming nitric acid, oil of caraway yields a black greasy resin (Hasse, Crell. Ann. 1785, 1, 422), oxalic acid (Gren, Crell. Ann. 1786, 2, 151; Grotthuss, N. Gehl. 8, 709.) With oil of vitriol, caraway-oil forms a black mass, with rise of temperature and evolution of sulphurous acid. (Schweizer.)— With pulverised hydrate of potash, it immediately assumes a deep brown colour; the mixture when repeatedly distilled yields colourless carvene, and leaves a thick, strongly intumescent mass, consisting of carvacrol, a resin soluble in aqueous potash, and another insoluble therein. The resin which is left behind on treating the residue with aqueous potash, is dark brown, brittle, melts at 90°, dissolves in alcohol and ether, and, contains 80.90 p. c. C, 9.23 H, and 9.87 O; the resin which separates, together with the carvacrol, from the potash-solution on addition of oil of vitriol, is dark-brown, transparent, melts at 100°, is not precipitated from its alcoholic solution by neutral acetate of lead, and contains 77.88 p. c. C, 8.56 H, and 13.56 O. (Schweizer.)—Oil of caraway heated with alcoholic potash, leaves a soft, coloured resin, only partially soluble in aqueous potash. (Völkel, Ann. Pharm. 35, 308 and 85, 246.)—It is not altered by distillation over lims and hydrate of potash. (Schweizer.)—Distilled with aqueous chromate of potash and sulphuric acid, it yields acetic acid and a peculiar acid, the greater part of which is however decomposed by the chromic acid. (Persoz, Compt. rend. 13, 433; J. pr. Chem. 25, 59.)—Heated with finely divided corrosive sublimate, it turns brown and afterwards b

Crude oil of caraway absorbs a large quantity of sulphuretted hydrogen gas, acquiring an offensive odour, and depositing after a few days a small quantity of sulphur. (Planche, J. Pharm. 8, 372.) It dissolves sulphur abundantly when heated, depositing it again on cooling; likewise phosphorus; it does not dissolve chloride of calcium. It is somewhat soluble in water, to which it imparts its odour and taste; it dissolves with

facility in alcohol and ether. (Schweizer.)

Hydrosulphate of Carvol-

 $C^{20}H^{15}O^{2}S = C^{20}H^{14}O^{2},HS.$

VARRENTRAPP. Liebig, Poggendorff & Wöhler, Hand. d. Chem. 4, 686.

Sulfhydrate de carvol. (Gerhardt.)

When the portion of oil of caraway (principally carvol), which distils above 190°, is covered with an equal volume of alcoholic hydrosulphate of ammonia, and left to stand for half an hour, it yields crystals of hydrosulphate of carvol, which, after the mother-liquor has been drained off, may be washed with alcohol and recrystallised from hot alcohol.

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tassed for a long time in alcohol; the visel in alcohol; the visel in alcohol; the visel in alcohol, where it is a long to the boiling post is heaten to the boiling post in the visel in the decay which alcohol is a strong to the decay with a long to the decay of th

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- 22							arrentrapp
20	C		120	-	65'58	********	65.68
15	H	***************************************	15		8.19		8.22
3	S		48	***	26.23		26.76
C20	H	4S2,HS	183		100:00		100.66

Its ethereal solution forms with an ethereal solution of mercuric chloride, a white precipitate containing variable quantities of mercury (18.5 o 70.5 p. c.) and of chlorine (5.6 to 11.1 p. c.), according as one or the ther solution has been added in excess; the precipitate gives off hydro-Aloric acid in drying, but without alteration of external appearance. -Dissolved in a large quantity of ether, it forms with bichloride of platinum precipitates of variable composition.

Sulphothymic Acid.

 $C^{20}H^{14}S^{2}O^{8} = C^{20}H^{14}O^{2},2SO^{3}.$

. LALLEMAND. (1853.) Compt. rend. 37, 498; J. pr. Chem. 60, 432; abstr. Ann. Pharm. 101, 120. - N. Ann. Chim. Phys. 49, 150; abstr. Ann. Pharm. 102, 119.

Thymolschwefelsäure, Sulfothyminsäure.

Formation and Preparation. Thymol dissolves abundantly in oil of itriol at 50-60°, and solidifies on cooling to a crystalline mass, having only faint red colour. By dissolving this mass in water, and saturating the soluion with carbonate of baryta or carbonate of lead, sulphothymate of baryta r lead is obtained, from which the sulphothymic acid may be separated, and rystallised by evaporating its aqueous solution in vacuo. — Thymol from tychotis-oil dissolves in moderately warm oil of vitriol, forming a red liquid which middifes on cooling, and when treated with hot water, yields a colourless solution (only few red oil-drops remaining undissolved), which crystallises on cooling. The crystals passes of a conjugated sulphuric acid, which forms crystallisable salts with baryta and xide of lead; but the quantity obtained was too small for analysis. (Stenhouse.)

Properties. Translucent, pearly tables or prisms. Does not deliquesce to the air Contains 2 At water of covatallisation and in

n exposure to the air. Contains 2 At. water of crystallisation, and is

perefore C20H14S2O8 + 2Aq.

Its aqueous solution, treated with nitric acid, forms binitrothymol; ith sulphuric acid and peroxide of manganese or bichromate of potash, it rms thymoil,

Very soluble in water,

With salifiable bases it forms the sulphothymates C20H13MS2O3, which rystallise in forms of the oblique prismatic system. They decompose t 120°, with violet-red colouring and volatilisation of thymol. The mmonia-salt, which separates from its aqueous solution in well-developed rystals, and the potash and soda-salts, leave, when thus treated, anhydrous isulphates. [As however they contain only 13 At. H and 8 At. O, the quantity of 10 is too small by 1 At. for this transformation: C²⁰H¹³MS²O⁸ = [(C²⁰H¹⁴O² - HO) + MO,2SO³. (Kr.)] — The sulphothymates dissolve very easily in water nd in absolute alcohol, somewhat less in other.

Sulphacetothymic Acid.

 $C^{ac}H^{10}S^{1}O^{10} = C^{4}H^{3}O^{3}, C^{20}H^{12}O, 2SO^{3}.$

LAZZEWAND. (1857.) N. Ann. Chim. Phys. 49, 150; abstr. Am. Phys. 102, 120.

When thyrnol is dissolved in glacial acetic acid, and oil of vital committing a little anhydrous sulphuric acid is added to the mixture commitments takes place at a gentle heat, and the liquid, on cooling demonstrate takes place at a gentle heat, and the liquid, on cooling demonstrate takes place at a gentle heat, and the liquid, on cooling demonstrate takes place at a gentle heat, and the liquid, on cooling demonstrate takes place at a gentle heat, and the liquid, on cooling demonstrate takes place at a gentle heat, and the liquid, on cooling demonstrate takes place at a gentle heat, and the liquid, on cooling demonstrate takes place at a gentle heat, and the liquid, on cooling demonstrate takes place at a gentle heat, and the liquid, on cooling demonstrate takes place at a gentle heat, and the liquid, on cooling demonstrate takes place at a gentle heat, and the liquid, on cooling demonstrate takes place at a gentle heat, and the liquid, on cooling demonstrate takes place at a gentle heat, and the liquid, on cooling demonstrate takes place at a gentle heat, and the liquid, on cooling demonstrate takes place at a gentle heat, and the liquid, on cooling demonstrate takes place at a gentle heat, and the liquid, on cooling demonstrate takes place at a gentle heat, and the liquid demonstrate takes place at a gentle heat, and the liquid demonstrate takes place at a gentle heat, and the liquid demonstrate takes place at a gentle heat, and the liquid demonstrate takes place at a gentle heat, and the liquid demonstrate takes place at a gentle heat, and the liquid demonstrate takes place at a gentle heat, and the liquid demonstrate takes place at a gentle heat, and the liquid demonstrate takes place at a gentle heat, and the liquid demonstrate takes place at a gentle heat, and the liquid demonstrate takes place at a gentle heat, and the liquid demonstrate takes place at a gentle heat, and the liquid demonstrate takes place at a gentle heat, and the liquid demonstrate takes place at a gentle heat, and the liquid demonstr

The acid is soluble in water. With bases, it forms crystalliable all, which become anhydrous without decomposition at 110°, but are deserved with Pherance of acetic acid, when their aqueous solutions are british or quickly evaporated. The salts are soluble in water saling absolute.

Suitable series and with carbonate of baryta. CaHuS'O', BaO, is obtained by attention the acid with carbonate of baryta.

Oxygen-nucleus C*H12O4.

Quassiin.

 $C_{x}H_{x}O_{t} = C_{x}H_{x}O_{t}O_{x}$

Windstein Egen. 34, 85; funder, 65, 74. Windstein Ann. Floren. 21, 40.

Processed by Windler in 1835, after Thomson (System of Chemistry, 4, 5, 7 had been been and 1, 1855, after Thomson (System of Chemistry, 4, 5, 7 had described to better unit to respect to the quassia-bitter which they had obtained as an extract heavy for presentating with basic accesse of lead, the aqueous solution of the quassia-citract, which had become crystalline by standing, evaporating the first to that carried after removing the lead by sulphuretted hydrogen, channing the accession which he required as quassia-bitter, though Wiggers regarded them as not common sulphuretted as quassia-bitter, though Wiggers regarded them as not common sulphuretted.

Quantitative. Quantitate. Quantitate — The bitter principle of the wood of Quantitate and Quantitate. Perhaps also of the bark of Quantitate Simaruba, instead with according to this bark freed from make and gallic acids by neutral according and from excess of lead by supplicated hydrogen, agrees in character with least from excess with a cause of the chief actions (Moran J. Pharm, 8, 57.) — By distilling quantitate with wints. Remnerschaut. Br. Arch. 36, 255), obtained a white tabular make quantitate program, having a promise odour of quantitate.

In the quantitative of the cause of pulverised quantitative of the cause of pulverised quantitative of the cause of pulverised quantitative of the cause of the cause of pulverised quantitative of the cause of the cause

haused with 2 lb of 50 p.c. alcohol; the tincture is evaporated in water-bath; the resulte dissolved in water; and the filtered solute evaporated to an extract. This extract is repeatedly treated with sufficient of absolute alcohol as long as the alcohol acquires the limit taste of quastic tipe filtrate is evaporated nearly to drynes; and the resolute is exhausted with her water, whereupon a small quantity of dark how water resin remains, while the light yellow solution, which must be

decolorised by animal charcoal, yields crystals of quassia by gentle evaporation. (Winckler.) From aqueous extract of quassia prepared by himself, Winckler was not able by any process whatever to obtain quassiin, perhaps because the extract had already undergone some alteration.—2. Eight pounds of quassiawood are boiled with water; the decoction is evaporated to 6 lbs.; the cooled residue is mixed with slaked lime, whereby pectin is chiefly separated; then left to stand, with frequent agitation; filtered; and the filtrate is evaporated nearly to dryness and boiled with alcohol of 80 to 90 p. c., which leaves gum, common salt, and nitre undissolved, and dissolves quassiin, together with brown colouring matter and small quantities of common salt and nitre. The alcohol is distilled off; and the residue is evaporated to dryness, dissolved in the smallest possible quantity of absolute alcohol, and mixed with a small quantity of ether, which throws down brown colouring matter. The filtrate evaporated to dryness is redissolved in absolute alcohol, precipitated by ether, and this treatment is repeated till a nearly colourless residue is obtained by evaporation no longer containing crystals of quassiin. Lastly, the etheralcoholic solution is poured upon a small quantity of water, and left to evaporate spontaneously, whereupon quassiin crystallises out. If the substances precipitated by ether are repeatedly treated with alcohol and ether as above, they yield a little more quassiin. (Wiggers.)

Properties. Crystallises by spontaneous evaporation from the etheralcoholic solution mixed with water, or, on cooling from the hot aqueous or slightly alcoholic solution, in white opaque, shining prisms, which lose 13 p. c. in weight at 100° in a current of air, and 0.37 p. c. more when heated to fusion. (Wiggers.) Very delicate slender needles, having a silky lustre. (Winckler.) — Melts somewhat less easily than colophony and solidifies to a transparent, yellowish, somewhat brittle mass. From solutions in absolute alcohol or ether, it is obtained as a transparent varnish, which becomes white and opaque when water is poured upon it, but does not crystallise. — Permanent in the air, inodorous, neutral. Its taste is extremely bitter, like that of quassia-wood, but much more intense. (Wiggers.) According to Winckler, it has a slight alkaline reaction.

20 C	120		66-67		Wiggers. mean. 65.75
20 C 12 H	120		66.67	*******	65.75
60	200	****	26.66		27.36

So, according to Gerhardt (Traité, 4, 330); according to Wiggers it is C20H121O6.

Decompositions. Quassiin, heated in a tube above its melting point, becomes more fluid, acquires a brown colour, chars, and gives off vapours which have an empyreumatic, rather acid odour, a slightly bitter taste, and redden litmus. (Wiggers.) In the open fire, it burns like a resin, with a bright very smoky flame, and leaves a loose, easily combustible charcoal. (Wiggers.) — Nitric acid of sp. gr. 1.25 dissolves quassiin, apparently without alteration, and, with the aid of heat, converts it into oxalic acid, with evolution of nitrous gas. (Wiggers.) — Oil of vitriol dissolves quassiin at mean temperature, forming a colourless solution, from which water separates the quassiin, apparently unaltered; on heating the solution, carbonisation takes place. (Wiggers.)

Quassiin does not dissolve very readily in water (Winckler); it dissolves slowly in 222 pts. of water at 12°, more easily in water containing foreign substances. (Wiggers.)

It does not neutralise acids. The solution in hydrochloric acid leaves when evaporated quassiin free from hydrochloric acid. (Wiggers.)

According to Winckler, quassiin neutralises acids but slightly.

The aqueous solution of quassiin is not precipitated by iodine, chlorine, neutral or basic acetate of lead, or iron-salts. (Wiggers.) According to Winckler, it is precipitated by mercuric chloride; but, according to Wiggers, it is not.

Tannin precipitates quassiin from its alcoholic solution in thick white flocks. (Winckler.)

Quassiin dissolves easily in alcohol, especially in hot absolute alcohol. The saturated solution in alcohol of 90 p. c. is rendered turbid by water, but becomes clear again on adding a large quantity of water. (Wiggers.)

It is but sparingly soluble in ether.

Oxygen-nucleus C20H10Os.

Opianyl.

$C^{20}H^{10}O^8 = C^{20}H^{10}O^6, O^2.$

Dublanc. (1832.) Ann. Chim. Phys. 49, 17.
Couerbe. (1832.) Ann. Chim. Phys. 49, 44.—50, 337.—59, 148.
Regnault. Ann. Chim. Phys. 68, 157.
Anderson, R. Soc. Edinb. Transact. 20, 347; Ann. Pharm. 86, 190; R. Soc. Edinb. Transact. 21, 204; Ann. Pharm. 98, 44.

Couerbe's Meconine.

First observed by Dublanc; prepared in the pure state by Couerbe.

Source. In opium. (Dublanc, Couerbe.)

Formation. 1. By the slow action of dilute nitric acid on opian (narcotine), together with teropiammone, cotarnine, opianic acid, and hemipinic acid; but it cannot be obtained with certainty. (Anderson.) - 2. By the action of strong caustic potash upon opianic acid, which is thereby resolved into opianyl and hemipinic acid. (Matthiessen & Foster,

p. 429.)

Preparation. A. From Opium. 1. Finely-cut Smyrna opium is exhausted with cold water; the filtrate is evaporated to 8° B.; and the morphium and opian are precipitated by dilute ammonia. The filtrate evaporated to a syrup and then left for several weeks in a cool place, deposits brown crystals, which must be pressed and then dried at a gentle heat. The brown crystalline mass contains opianyl, meconates, and other substances. It is exhausted with boiling alcohol of 36°, and the extracts are concentrated to one-third by distilling off the alcohol: the liquid then on cooling deposits crystals, which are purified by recrystallisation from boiling water, with addition of animal charcoal, then from hot other. The mother-liquor from which the crystals have separated, yields an additional quantity of opianyl by concentration. (Courbe.)

2. Aqueous extract of opium dissolved in water, is precipitated at the

OPIANYL.

boiling heat with ammonia and then left to cool, whereupon morphine separates, together with small quantities of opianyl and crystals of opian. The filtrate is evaporated down; the meconic acid precipitated with baryta-water; the excess of baryta removed from the filtrate by carbonate of ammonia; the clear solution evaporated to a syrup; the mother-liquor decanted after some days from the crystals of narceine which separate, then concentrated to a certain extent and treated with absolute ether, which takes up opianyl together with smaller quantities of opian and oil. The ether is evaporated; the opianyl separated from the residue by water; the hot aqueous solution decolorised by animal charcoal; the filtrate brought to the crystallising point; and the opianyl which separates, is purified by repeated crystallisation from water. (Pelletier, Ann. Chim. Phys. 50, 252.) — The opianyl precipitated by ammonia

may also be extracted by absolute other and purified like the rest.

3. The aqueous extract of opium is precipitated by chloride of calcium; the precipitated meconate of lime is filtered; the filtrate evaporated to the crystallising point, and separated from the deposited hydrochlorate of morphine; and the dark mother-liquor is diluted with water, filtered from the flocks which separate, and treated with ammonia, which precipitates opian, thebaine, and a large quantity of resin. The filtrate is mixed with acetate of lead; the excess of lead is removed from the filtered liquid by dilute sulphuric acid; and the filtrate is neutralised with ammonia and evaporated to the crystallising point at a moderate heat, whereupon narceine separates out, and then sal-ammoniac by further concentration. The mother-liquor is repeatedly digested with $\frac{1}{5}$ vol. ether at 26°, and the ether is distilled off from the extracts, a brown syrup then remaining. On treating this syrup with dilute hydrochloric acid, papaverine dissolves, and opianyl remains, in the form of a dark grey, crystalline powder, which, to free it from resin and purify it completely, must be several times crystallised from boiling water, with addition of animal charcoal. (Anderson.)

B. From Opian. Opian is heated in the water-bath to 49° with

2.8 pts. of nitric acid of sp. gr. 1.4, and 8 pts. water, whereupon it melts into a yellowish mass, dissolves slowly without evolution of gas, if constantly stirred, and then gradually deposits crystalline terapiammone. The liquid is filtered through asbestos; the filtrate saturated with potashley; the solution again filtered from the precipitated cotarnine, and concentrated to a small bulk ; crystallised nitre is removed, and the motherliquor freed from carbonate of potash by precipitation with alcohol; the alcohol distilled off; and the cooled residue treated with hydrochloric acid, which precipitates opianic acid, hemipinic acid, and opianyl. If this precipitate be dissolved in a large quantity of boiling water, opianyl crystallises out on cooling (mixed with a little opianic acid, if the quantity of water added was insufficient), and may be purified by recrystallisation from water

or alcohol. (Anderson.)

Properties. Slender, colourless, six-sided prisms, acuminated with two faces. (Couerbe.) White shining needles. (Anderson.) Melts at 90°, and solidifies again in an unctuous mass at 75°. It does not lose weight by prolonged fusion. Distils without alteration at 155° (Couerbe), not even at 270°. (Reguault, Ann. Chim. Phys. 68, 158.) Melts under water at 77°, per se at 110°, and solidifies at 104.5°. When cautiously raised to a high temperature, it volatilises, and sublimes in beautiful crystals. (Anderson.) Inodorous. Tasteless at first, but with sharp aftertaste. (Couerbe.) Its taste is bitter. (Anderson.)

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E. Arm. 16: 1012]. — Oplanyl dissolves in 265:7 pts. of cold water formed in 701 years at 15:5 Anderson). It dissolves in 18:36 pts. Anderson, of boiling water.

It arm is a less without alteration in hydrochloric acid; it is in the control of th

stime in section 2. but dissolves in potasti and in sodictey, and it real trate therefrom by carbonate of ammonia or by acids (Courted i arrears zo: to dissolve m re readily in alkalis than in water ; descunits with metallic exides, and is not precipitated by basic acetate of bak An least not a line not precipitated by solution of neutral acetate of lead, but its There are prescriptores at forming with it a crystalline compound of very variable con-

ianvl dissolves in alcohol, other, actic acid (Couerbe, Anderses, tile oils. (Couerbe.)

r combinations. With stearic acid.

Appendix to Opianyl.

Mechloic Acid.

COUERBE. Ann. Chim. Phys. 50, 343; further, 59, 148.

Mechlorsaure, Acide méchloique.

Formation and Preparation. When chlorine is passed into melting opianyl, the mass becomes red, then dark brown, and solidifies in the crystalline form on cooling. mass becomes red, then dark brown, and solidifies in the crystalline form on cooling. The mass which is nearly insoluble in water, and sparingly soluble in ether, is treated with boiling alcohol of sp. gr. 0.833, whereby a solution is formed which yields crystalline granules by spontaneous evaporation. The yellow acid mother-liquor contains the greater part of the absorbed chlorine. The crystalline granules are colourless, melt at 125°, volatilise at 190° — 192° with an odour of jasmin, decomposing partially at the same time, and yielding drops of a yellow oil which solidifies on cooling and contains 5.43 p. c. chlorine. This is dissolved in potash-ley and the boiling solution is saturated with nitric acid, whereupon the mechloic acid crystallises in prisms on cooling. The with nitric acid, whereupon the mechloic acid crystallises in prisms on cooling. The chlorinated crystalline granules may likewise be dissolved in weak alcohol, and the solution treated with oxide of silver, the acid crystallising as the filtrate evaporates, in pearly scales which are converted by crystallisation into four-sided prisms.

Long four-sided needles, which melt at 160°, and have an acid reaction.

Calculation acco	rding	to	Couerbe.		Couerbe.
14 C	84		49:12		48.63
7 H	7	****	4.09	*******	4.06
10 O	80	****	46.79		47.31
C14H7O10	171		100.00		100.00

Volatilises at 165, leaving a small quantity of charcoal. It is not decomposed by oil of vitriol or hydrochloric acid, but nitric acid decomposes it, apparently without formation of oxalic acid.

It dissolves sparingly in cold, more freely in boiling water. Precipitates lead-salts but not those of lime, iron, copper, mercury, or silver.

Dissolves in boiling alcohol and in ether.

Meconin-resin.

COUERBE. Ann. Chim. Phys. 53, 352; further, 59, 150.

When the chlorinated mother-liquor from which mechloic acid has separated (vid. sup.) is mixed with water, a brown chlorinated resin is deposited, from which the chlorine may be extracted by boiling with aqueous carbonate of soda.

					mean.
10 C	60	-	46.51		46.65
5 H	5		3.87		3.79
80	64	****	49.62	*******	49.56

According to Anderson, (Ann. Pharm. 98, 68), it is perhaps bichloropianyl. Insoluble in water, soluble in ether.

Opiansulphurous Acid.

 $C^{3}H^{10}S^{3}O^{13} = C^{30}H^{10}O^{3},2SO^{3}$

W. E. St. 122 Phora. 50, 10.

FORMALINE and Preparation. Hot aqueous opianic acid absorbs a mark quarter of salpharous acid gas, and, when the solution cools, no equation and reversalines out, provided the quantity present is not to equation and a sufficient degree of heat has been applied. The solution of the sufficient degree of heat has been applied. The solution of the surface at a greatle heat leaves opiansulphurous acid, generally somewhat moust have a leaves opiansulphurous acid, generally somewhat moust have substituted and accidental product. (Wöhler.) Persent is a resolution in the supposition and the opianic acid to opianyl, which then units with the suppositions and the suppositions are the suppositions and the supposition are the suppositions are the supposition and the supposition are the supposition are the supposition and the supposition are the supposition and the supposition are the supposition are

Properties. Insolution, finely-crystalline mass. Has a poculiar bitter mass. With reversità affertante.

manuscripturies and is according to Wöhler C*H70*,280°; according to General collections and is according to General collections while an and is according to the amount and the amount of the amount of the most revolute of amounts (xii, 27.) The latter forms according to the most revolute does not however explain the resolution of opinional according to the most revolute does not however explain the resolution of opinional according to the according to the water at the ked-said, only on the supposition that the said we exclude seed at the temperature employed to drive off the water. (Kr.)

The rate is poured upon opiansulphurous addressing in some it said likes we partly undecomposed, whilst another the said which separates, and sulphurous acid, after addition of hydrocomposed in the said which separates, and sulphurous acid, after addition of hydrocomposed in the said which separates, and sulphurous acid, after addition of hydrocomposed in the said which separates are said which separates and sulphurous acid, after addition of hydrocomposed in the said which separates are said which separates and sulphurous acid, after addition of hydrocomposed in the said which separates are said which separates are said which separates and sulphurous acid.

The explorates of barium and lead dissolve in a second control of suppliers sold, forming crystallisable sales of an real coolingsself by nitric acid, and only partially by

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towness milk-white them yellow by exposure to light the first at 170°, in all 13.68 p. 6. The first at 170°, in all 13.68 p. 7. The first at 170°, in all 13.68 p. 7. The first at 170°,

	a,	ng to Ger	hardt.	ь.			Wohler.
20 C		29.05	20 C		30.23		29.23
13 H		3.15	13 H	***************************************	3.27		3.00
17 0	*****************************	32-93	15 0		30.23		33.00
28	***************************************	7.75	28		8.06		8:10
PbO	***************************************	27.12	PbO	***************************************	28.21	****	26.67
C***H7	PbO8,28O2+6Aq	100.00	C20H9	PbO8,2SO2 + 4Aq	100.00		100.00

According to Wöhler, it is C20H6PbO8,2SO2+6Aq. (p. 426). The 4 At. water of formula b correspond to 9:07 p. c.

Opianic Acid.

C20H10O10 = C20H10O6,O4.

LIEBIG & WÖHLER. (1842.) Ann. Pharm. 44, 126.

Wöhler. Ann. Pharm. 50, 1.

J. Blyth. Ann. Pharm. 50, 36.

LAURENT. Compt. rend. 20, 1118; N. Ann. Chim. Phys. 19, 372; J. pr.

Chem. 40, 408; Ann. Pharm. 62, 105; Compt. rend. 21, 1118; further, 24, 219; N. Ann. Chim. Phys. 19, 370; Pharm. Centr. 1847, 381.

Anderson. R. Soc. Edinb. Trans. 20, 347; Ann. Pharm. 86, 179; J. pr. Chem. 57, 358. — R. Soc. Edinb. Transact. 21, 204; abstr. Ann. Pharm. 98, 44; N. Ann. Chim. Phys. 46, 105; Chem. Centr. 1856, 450.

Formation. 1. In the oxidation of opian (narcotine) by peroxide of manganese and sulphuric acid (Liebig & Wöhler), by peroxide of lead and sulphuric acid. (Marchand.)—2. By boiling hydrochlorate of opinn with excess of bichloride of platinum and water. (Blyth.)—3. By the action of dilute boiling nitric acid upon opian. (Anderson.)— 4. By boiling teropiammone with potash-ley. (Anderson.)

Preparation. 1. Opian is dissolved in excess of dilute sulphuric acid; finely pulverised peroxide of manganese is added; and the liquid is heated to the boiling point, whereupon it turns yellow and gives off carbonic acid; the boiling is continued, with frequent addition of peroxide of manganese and sulphuric acid, so as to keep both in excess, as long as carbonic acid continues to escape; and the liquid is filtered at the boiling heat,—the straw-yellow filtrate then depositing yellow crystals of opianic acid as it cools. — These crystals are triturated and thrown upon a filter, then pressed, washed several times with cold water, again strongly pressed, heated to boiling with hypochlorite of soda till they become quite colourless, and gradually mixed with excess of hydrochloric acid : the liquid then on cooling deposits crystals of opianic acid, which are washed with water, strongly pressed, and purified by recrystallisation from boiling water. The mother-liquor yields a little more scid by evaporation.

— 2. Opian dissolved in dilute hydrochloric acid is boiled with excess of bichloride of platinum and water for half an hour, whereupon the liquid first assumes an orange then a dark red colour, and the platinum-salt, which has also become dark-coloured, melts. The liquid is filtered hot, and the impure opianic acid, which crystallises from the filtrate on To larg a purified by recrystallisation. (Blyth.) The mother-liquor yields The mother-liquor of the preparation of opinol is a later with the evaporation of opinol is a later with the primitive visits a later opinic acid by evaporation. (Anderson.)

masses. The messence of an extremely small quantity of nanthopenic acid colors The acid has a slightly bitter taste and a weak acid reaction. At 140 it melts, without giving off water. It is not volatile but seems up the sides of hot glass vessels, so that it appears to distil Tuest spianic acid remains soft, transparent, and of the poissistence of turnertime for several hours after cooling, then begins the almost a miley victoress from the surface inwards, and slowly martiers in the course of a few days, without however exhibiting any rysman a structure tither the microscope. If water or alcohol be poured mean this amorphous opumic acid, while still transparent, it becomes mile-wants and if build with the liquid, is converted into a white mass a small quartity of which dissolves, and separates of emanded by the normarded present the appearance of a mixture of log member and small there's nel crystals. Fused opianic acid is not dissolved my at most amminus and only after prolonged boiling by aqueous potati

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pertially conversed into bemiginic acid by boiling with aquest

bichloride of platinum. (Blyth.) - ¶ 8. Evaporated nearly to dryness with an excess of strong potash, it is converted into opianyl and hemipinic acid. (Matthiessen & Foster. Proc. Roy. Soc. 11, 57.)

$$2 C^{20}H^{10}O^{10} = C^{20}H^{10}O^{8} + C^{20}H^{10}O^{12}$$
.

9. Distilled with concentrated hydriodic acid, it yields iodide of methyl and a non-volatile substance, which is easily decomposed by heat, and oxidises readily in the air, especially in contact with alkalis. (Matthiessen & Foster.) ¶

Combinations. Opianic acid is slightly soluble in cold water, much more soluble in hot water, so that the solution solidifies completely on cooling. (Wöhler.) — With bases, it forms the Opianates, all of which are soluble in water. — Hot aqueous opianic acid decomposes the carbo-

nates of barium, lead, and silver, with effervescence.

Opianate of Ammonia. — Opianic acid absorbs ammonia gas, with rise of temperature, and deliquesces instantly in aqueous ammonia. - The saturated solution of opianic acid in ammonia, mixed with alcohol, and left to evaporate, yields large tables. If the solution be evaporated even at a very gentle heat, a transparent amorphous mass is obtained, which when covered with water, becomes milk-white and dissolves but partially, leaving opiammone in the form of a white powder. (Wöhler.)

Opianate of Baryta. Prisms united in radiating groups, which efflo-

resce when heated, giving off 6 p. c. water (2 At. = 6.09 p. c. Aq.), and dissolve very readily in water. (Wöhler.)

Opianate of Lead. Obtained either in very brilliant transparent crystals apparently of the form of sphene, or in anhydrous, slender prisms united in tufts. The former crystals contain 5.4 p. c. water (2 At. = 5.44 p. c. Aq.), part of which they give off at 130°, and the rest at 150°, melting at the same time. Begins to decompose at 180°. — Dissolves with some difficulty in water, more readily in alcohol. (Wöhler.)

Crystals.					Wöhler.
20 C	120.0	****	36-27	*******	36.23
11 H	11.0	****	3.32		3.34
11 0	88.0	****	26.61		26.81
PbO	111.8	****	33.80	*******	33.62
C20H9PbO10 + 2 HO	330.8		100.00		100.00

Opianate of Silver. - Short, translucent prisms, with a tinge of yellow, which however appears to be produced in the first instance by the action of light, the colour being afterwards unaffected by light. Gives off its water of crystallisation towards 100°, and at 200° becomes opaque and melts into a liquid of fine dark green colour and metallic lustre, afterwards acquiring a red metallic colour and ultimately leaving metallic silver. (Wöhler.)

Dred at	1000				Wöhler.
20 C	120		37.86	********	37.85
9 H	9	****	2.84		3.10
90	72	****	22.71	*******	22:36
AgO	116		36.59	10000	36.69
C20H9AgO10	317		100.00		100.00

Opianic acid dissolves in alcohol and ether.

Acid.

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T-#	tote i		W. Hick	Blyth.	Anderson.
27 C	. ::		32.94 4:65		
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We have enough we will be a constrained HiO; it was first recognised by the constraint parents of the man 2 of 1100 $^\circ$

(W. filer - Heated with pencel bed and dilute sulphuric acid appears to be completely resolved into carbonic acid and water We hier." - Distilled with excess of concentrated hydriodic acid, it is completely resolved into carbonic acid, iodide of methyl, and an acid having the composition C14H6O9. (Matthiessen & Foster, vid inf.)

$$C^{20}H^{10}O^{12} + 2HI = C^{14}H^{6}O^{8} + 2C^{2}H^{3}I + 2CO^{2}$$
.

Combinations. Hemipinic acid dissolves with difficulty in cold water

(Wöhler); more readily than opianic acid. (Blyth.)

Hemipinic acid is bibasic. (Laurent.) It forms bibasic (neutral) salts C20H8M2O12 and mono-basic (acid) salts C20H2MO12. (Anderson.) The lead, silver, and ferric salts are insoluble. The last has a fine orangeyellow colour. (Blyth.)

Hemipinate of Ammonia. — Crystals permanent in the air. (Wöhler.) Hemipinate of Potash. — a. Bibasic. — Easily soluble; crystallises with difficulty. (Anderson.) — b. Monobasic. — Obtained by half saturating aqueous hemipinic acid with potash, and evaporating. — Forms thick, six-sided tables. Has a strong acid reaction. Contains 14·3 p. c. water of crystallisation (5 At. = 14·55 p. c. Aq.), which it gives off at 100°. Easily soluble in water and alcohol. (Anderson.)

					Anderson
20 C	120.0	· Ness	45.42		45.04
9 H	9.0	****	3.40		3.46
110	88.0		33.32	*******	33.62
ко	47.2	****	17.86	*******	17.88
C20H9KO12	264.2	70.00	100.00	Alexandre	100.00

Hemipinate of Lead. - White precipitate insoluble in water. It dissolves in aqueous acetate of lead and afterwards separates in transparent crystalline nodules. (Wöhler.)

Hemipinate of Silver. - Bibasic. - White precipitate insoluble in

water.

					Wöhler.		Blyth.
20 C	120	****	27.28		27.19		27.98
8 H	8		1.81	*******	1.83	444	2.00
10 O	80	460	18.18	*******	18.10	vac	17:27
2 AgO	232	****	52.73	********	52.88		52.75
C ²⁰ H ⁸ Ag ² O ¹²	440	****	100.00		100.00	****	100.00

Contains 53.05 p. c. AgO. (Anderson.)

Hemipinic acid dissolves more readily in alcohol than in water. (Wöhler.) It is easily soluble in ether. (Blyth.)

¶ Appendix to Hemipinic Acid.

Acid produced by the decomposition of Hemipinic Acid. C14H6O8.

A. MATTHIESSEN & G. C. FOSTER. Proceedings of the Royal Society, 11,58.

Obtained by distilling hemipinic acid with concentrated aqueous hydriodic acid (vid sup.) and evaporating the residue on the water-bath: purified by crystallisation from water. It forms colourless, needlo-shaped crystals. Its aqueous solution has a strong acid reaction to test-paper. At 100°, the crystals lose 14.80 p. c. water (3 HO = 14.92 p. c.), and slowly sublime.

Dried at	100°.	N	latthies	sen & Foster.
The same of the sa	84		*******	54.39
C Cilitation	64	3.90	*******	3·91 41·70
C14H6O8 1	54	. 100.00		100.00

The composition of this acid assigns it a place in the following series. $C^{14}H^6O^2$ Oil of bitter almonds. $C^{14}H^6O^4$ Benzoic acid.

C¹⁴H⁶O⁶ Salicylic acid.
C¹⁴H⁶O⁸ Acid from hemipinic acid (M. & F.)
C¹⁴H⁶O¹⁰ Gallic acid.
2 C¹⁴H⁶O¹² Tannoxylic acid.

Its behaviour with ferric chloride (inf.) connects it with salicylic and gallic acid.

Heated for some time to a little above 100°, it gradually becomes brown; the same change takes place when a pure aqueous solution is evaporated on the water bath, but appears to be prevented by the presence of a trace of hydriodic acid.

It is moderately soluble in cold water; very soluble in hot water.

It has decided acid properties, but none of its salts have yet been obtained pure. Its alkaline and alkaline-earthy salts are very quickly coloured brown in the air. The lead-salt is a yellowish white, curdy precipitate; the silver-salt decomposes almost instantaneously, even in the cold, with separation of metallic silver; the copper-salt is decomposed at 100°, with separation of suboxide of copper. With sesquichloride of iron, the acid or its ammonia-salt gives an intense indigo-blue coloration, which is destroyed by strong acids, and changed to blood-red by ammonia. In a clear mixture of sesquichloride of iron with red prussiate of potath, it causes an immediate precipitate of prussian blue.

The acid dissolves very readily in hot alcohol and ether.

Sulphopianic Acid.

 $C^{20}H^{10}S^{2}O^{8} = C^{20}H^{10}O^{6}S^{2}O^{2}$

Wöhler. Ann. Pharm. 50, 12.

Comp. page 428. When washed sulphuretted hydrogen gas is passed into aqueous opianic acid heated to 70°, the solution becomes turbid and deposits sulphopianic acid, the formation of which does not cease till after the sulphuretted hydrogen has been passed through the solution for

a day.

Yellowish powder, which, if heated while still immersed in the mother-liquor, melts to a pale yellow, clear oil which solidifies on cooling. The alcoholic solution yields slender, pale yellow transparent prisms, which soften below 100°, melt completely below 100°, and cannot afterwards be obtained in the crystalline form by spontaneous evaporation of their alcoholic solution.

Am	orph	us.			Wöhler.
20 C	120	****	53.10		53-15
10 H	10	****	4.42	*******	4.19
28	32		14.16	*******	14.32
8 O	64	****	28.32	*******	28:34
C20H10S2O8	226	1717	100.00		100.00

It is therefore opianic acid having 2 At. O replaced by 2S, or 2HO by 2HS. Wöhler originally gave the formula C²⁰H⁹S²O⁸, which was altered by Gerhardt (Compt. chim. 1, 61), and Laurent (Compt. rend. 20, 1118, 21, 1418.)

Decompositions. When heated above its melting point, it emits a strong sulphur-yellow vapour, which thickens to fine yellow crystalline needles, insoluble in water, easily soluble in alcohol. — It burns with flame and the odour of sulphurous acid. — In alkaline solution, it decomposes after a while, with formation of metallic sulphide.

Combinations. It dissolves in alkalis, forming a yellow solution which, when recently prepared, may be precipitated by acids without evolution of sulphuretted bydrogen.

evolution of sulphuretted hydrogen.

Sulphopianate of Lead. — Ammoniacal sulphopianic acid added to neutral acetate of lead, throws down a copious brown-yellow precipitate which becomes brown-black after a while, under the liquid, and at the boiling heat is immediately converted into black sulphide of lead.

Sulphopianate of Silver. — A solution of sulphopianic acid in ammonia forms with nitrate of silver, a brown-yellow precipitate, which, if left under the liquid, changes after a while to black-brown sulphide of silver. If quickly filtered and dried in vacuo, the precipitate may be melted on paper without loss of weight. When burnt, it leaves black sulphide of silver. It contains quantities of silver varying from 28 to 37 per cent. (C[®])H[®]AgS[®]O[®]=32·43 p. c. Ag.).

(C²⁰H³AgS²O³=32·43 p. c. Ag.).

The same precipitates are obtained with lead and silver-salts, by dissolving the sulphopianic acid in boiling mono-hydrosulphate of ammonia, volatilising the excess of the base, and then adding the metallic salts. Sulphopianic acid is therefore not a sulphide, since it combines,

not with sulphur-bases, but with oxides.

Sulphopianic dissolves readily in alcohol, forming a yellow solution.

Conjugated Compounds of the Opian-series.

Opianate of Ethyl.

 $C^{24}H^{14}O^{10} = C^{4}H^{5}O, C^{20}H^{9}O^{9}.$

Wöhler. Ann. Pharm. 50, 5. Anderson. Ann. Pharm. 86, 193.

Opianic ether, Opiannaphtha, Opiansäure-äther, Opian-vinester.

Formation and Preparation. — When a warm alcoholic solution of opianic acid is saturated with sulphurous acid, and the liquid somewhat concentrated, opianic ether crystallises out on cooling. (Wöhler.) — It vol. XIV.

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Les Sangue de Liebengauber, Vallengalier.

Promoted by passing hydrochloric acid gas into a solution of hearnear much in absolute accided.

Frozense Needles grouped in table which melt to a transparent to but an ideal when heated a one, and at the boiling point under water It has a strong and reaction. Gives off 9.93 p. c. water at 100 (calculation I Appel 50 p. c.).

			. A	aderson.
I4 C 144		56-69		56.45
14 H 14		5.21		5-67
110 96		37.80	••••	37.88
CH50 HO.C"H"O" 254	1	100-00		100-00

Yel is alechol when boiled with potash.

In dissolves sparingly in cold, somewhat more freely in boiling

The ethyl-hemipinates are difficult to obtain pure. Aqueous hemic acid does not precipitate lead or silver salts, but forms a bulky.

**Eva-yellow precipitate with **sequichloride of iron.

Ethyl-hemipinate of Baryta. — Obtained by digesting the acid with carbonate of baryta. Small tufts of needles which appear to decompose with great facility.

Opiammone.

C40H19NO16 = C40H17AdC14,O2.

Wöhler. Ann. Pharm. 50, 6.

Binopiammone (Anderson, Ann. Pharm. 86, 189.)

Formation. In the decomposition of opianate of ammonia by heat.

(Comp. xiv, 429.)

Preparation. A solution of opianic acid in ammonia is evaporated to dryness at a gentle heat; the transparent amorphous residue is kept at a heat somewhat above 100° and constantly stirred as long as it smells of ammonia; and the mass, which has now become pale yellow and insoluble in water, is freed by boiling with water from any opianate of ammonia that may have escaped decomposition.

Properties. Pale yellow powder consisting of microscopic, translucent, crystalline lumps; in the perfectly pure state, it would probably be colourless. Melts easily when heated, and creeps up the side of the

vessel, without subliming.

					mean.
40 C	240		59.85	********	59.86
19 H	19	****	4.74		4.88
N	14		3.48		3.75
16 O	128	****	31.93	********	31.51

Wöhler formerly supposed it to be C60H17NO6.—Opiammone = 2 At. C50H16O10 + 1 At. NH3 — 4 At. HO

Decompositions. 1. Opiammone somewhat strongly heated in contact with the air, smells like melting opianic acid, and gives off a yellow vapour. —2. When it is boiled for some time with water, a small portion dissolves, probably in consequence of decomposition. Heated with water to 150° in a sealed tube, it dissolves completely, forming a clear pale yellow liquid, which on cooling deposits crystals of opianic acid, while opianate of ammonia remains in solution. —3. It dissolves in cold oil of vitrol, forming an orange-yellow solution, which is rendered milky by water, but becomes clear again when heated, and deposits crystals of opianic acid on cooling, an ammoniacal salt being formed at the same time. — It is not altered by hot dilute acids. —4. An aqueous solution of pure potash or carbonate of potash dissolves opiammone after a few seconds, with evolution of ammonia, forming a uranium-yellow solution. On boiling the solution, \(\frac{1}{4}\) of the ammonia belonging to the opiammone escapes, and hydrochloric acid then precipitates yellow flocks of xanthopenic acid, whilst the filtrate on cooling yields crystals of opianic acid mixed with xanthopenic acid.

2 F 2

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Visite des Piere il 1

Prosent w inding remanant with paralleless and, age.

Beautiful velow facts, farming when it is a community proving, which as

remains under the measurage. Facility. Given off measurain when beautiful.

Beautiful is alkalie with the velow minure.

Teropiammone.

 $C^{\alpha}E^{\alpha}XC^{\alpha} = C^{\alpha}H^{\alpha}A_{\alpha}O^{\alpha}, C^{\alpha}H^{\alpha}O^{\alpha}.$

Luciana, Asa Fran. 16, 157.

Produced in variable, but always very small quantity, together a many scher products, when recan is decomposed by dilute nitric to 422 Experimently washing with alcohol and recrystallisation for the product.

Small mountain leviles.

4	<i>At</i> 100°.				
60 C	360	58-91		59.20	
29 H	29	4.14		4.98	
N	14	2.29		2.12	
2 5 O	208	34.06		33.70	
CeH=202	611	100.00		100-00	

Decompositions. Cold oil of vitriol dissolves teropiammone wellow, or, when heated, with fine crimson colour. — Teropiammon not decomposed by hydrockloric acid or ammonia, but nitric acid desiposes it; it is also decomposed by potast into ammonia and opis acid.

It dissolves sparingly in cold, somewhat more in boiling alcohols in other. (Anderson.)

Oxyiodo-nucleus C20IH9O6.

Iodopianyl.

C20IH9O8 = C20IH9O6,O2.

ANDERSON. Ann. Pharm. 98, 48.

Iodomeconin, Hydrure d'iodopianyle. (Gerhardt, Traité, 4, 1049.)

Formation and Preparation. When chloride of iodine is added to aqueous opianyl, and the mixture left to itself for several days in a warm place, long crystals form in it, contaminated by free iodine. They are purified by recrystallisation from boiling alcohol.

Properties. Colourless needles, which melt at 112° to a colourless

liquid.

				The same of	- 4	Anderson.	
	20 C		120.0	37.48		37.16	
	9 H		9.0	2 81		2.96	
-	I	***************************************	127.1	39.70	********	39.48	
	80		64.0	20.01		20.40	
	C201H	19O8	320.1	100.00		100.00	

Decompositions. Melts at a temperature above 100° to a brown liquid, which decomposes at a stronger heat, with volatilisation of iodine.—It dissolves in oil of vitriol, forming a dark-coloured liquid when heated.—It is decomposed by nitric acid, with separation of iodine.

It is nearly insoluble in water, more soluble in alcohol and ether.

Bromine-nucleus C20Br4H12.

Brominated Oil of Turpentine.

C20Br4H12.

DEVILLE. Ann. Chim. Phys. 75, 63; J. Pharm. 26, 678.

Bromterpenthinöl, Terpenthinolbromür. (Löwig.) Bromure d'essence de térében-thine. (Deville.) Essence de térébenthine quadribromé.

Formation and Preparation. Oil of turpentine is gradually mixed with small quantities of bromine, till a dark red, fuming, viscid, heavy liquid is produced; this liquid is partially decolorised by animal charcoal; and the free hydrobromic acid and water contained in it are removed by agitation with chalk and chloride of calcium.

Properties. Sp. gr. 1.975 at 20°. - Dextro-rotatory.

100					Deville. mean.
20 C	120		26.55		27.43
4 Br	320		70.79		
12 H	12	****	2.66	********	3.00

Isomeric with bromoterebene.

438 PRIMARY NUCLEUS C"H": OXYBROMINE-NUCLEUS C"RHO.

Bromoterebene.

C*Br4H13.

DEVILLE. Ann. Chim. Phys. 75, 51; J. pr. Chem. 22, 92; J. Phon. 25, 666.

When bromine is slowly dropped into well-cooled terebene, till the liquid acquires a deep red colour, a large quantity of hydrobromic acid a given off, and bromoterebene is formed, which may be decolorised, though not completely, by treatment with animal charcoal. Reddish, viscid liquid, of sp. gr. 1 978 at 20°.

				Deville.
29 C			*******	27-43
12 H			••••••	2.95
CaB4H3	452	. 100-00		

Isomeric with brominated oil of turpentine.

When henced it gives off hydrobromic acid (which yields free browing in commer with the air) and leaves a residue of charcoal.

Czycromine-nucleus C BrHO.

Bromopianyl.

 $C^{\infty}H^{3}BrO^{4} = C^{20}BrH^{9}O^{4}, O^{2}.$

ANDERSON. Les Fier . 98, 48.

Brownersmen, Spirare de fromopienyle. (Gerhardt, Trailé, 4, 1049.)

Formation 202 Preparation. When bromine-water is graduly solicitic acreeus orianyi, crystals of bromopianyl separate out, and my be purified by recrystallisation from boiling alcohol.

Properties Colouriess needles, which melt at 167°, and behave a

viter respects the chargent

					Anderson.			
20 (120		43-95	****	43.81			
9 H	9		3.29	*******	3.40			
Br	50		29.30	****	29-21			
30	64		23.46		28.58			
("H'BrO"	273		100.00		100-00			

polves sparingly in water, more readily in alcohol and other.

Chlorine-nucleus C20Cl2H14

Bichloroterebene.

C20Cl2H14.

DEVILLE. Ann. Chim. Phys. 75, 49; J. pr. Chem, 22, 91; J. Pharm. 26, 665; Pogg. 51, 433.

Monochlortérébène.

When the product obtained, together with hydrochloric acid and hydrochlorate of terebene, by the distillation of quadrichloroterebene, is heated with a quantity of potash-ley sufficient to saturate the hydrochloric acid which is set free, bichloroterebene is produced, and may be dehydrated by rectification over chloride of calcium:

$$3C^{20}Cl^4H^{12} = 20C + 2C^{20}Cl^2H^{14} + 8HCl.$$
 (Deville.)

Colourless oil, of sp. gr. 1.137 at 20°; refracting power 1.5186 (Deville), 1.531. (Becquerel & Cahours, Pogg. 51, 427.)

				-	Deville.
20 C 2 Cl					-
14 H					6.83
C20Cl2H14	205	lanu.	100:00		77.7

It is resolved by heat into hydrochlorate of terebene (p. 274), and a residue of charcoal.

Chlorine-nucleus C20Cl4H12.

Chlorinated Oil of Turpentine.

C20Cl4H12.

DEVILLE. Ann. Chim. Phys. 75, 57; J. Pharm. 26, 672; J. pr. Chem. 22, 97. - Pogg. 51, 433.

Chlorterpenthinöl, Terpentinölchlorür. (Löwig.) Chlorocamphene. (Deville.)
Chlorocamphose. (Laurent.) Essence de térébenthine quadrichloré. (Gerhardt.)

Formation and Preparation. - When chlorine gas is very slowly passed over artificial camphor (p. 265), a small quantity of hydrochloric acid gas is evolved, and there is formed a liquid coloured yellow by chlorine (C20H12Cl4, HCl, according to Deville), which decomposes with explosion, even in the atmosphere of chlorine, but still more in contact with the air, giving off hydrochloric acid gas and chlorine, and solidifying to crystalline chlorinated oil of turpentine. - It is also produced, mixed with

quadrichloroterebene, by passing chlorine into oil of turpentine (p. 248).

Properties. Crystalline mass of sp. gr. 1.5 at 8°, and refracting power = 1.5448. Melts without volatilising between 110° and 115°. Has no optical rotatory power.

AND PRINCIPLE CHE: CHLORING-SUCLEUS CHCHIC.

		Deville.			
			MOST.		
39 C	<u>::55</u>	43-79 _	43-54		
+ 3	143	31 <i>-</i> 33			
33 I	13	433 _	4 -8 0		
- THE TABLE	774	160-60			

innere wit probablementes.

Jerman strains. When surviy heated, it gives off a large quantity of hydrocaume acut gas, with separation of charcoal, and yields a distillate communing in minemated it if appendixe, artificial camphor, a body spinninge et mobile.

Quadrichloroterebene.

C=C;4H3.

Ex- Les. Chin. Pips. 75, 48; J. pr. Chem. 22, 90; J. Pharm. ist. 1884.— Figs. 51, 453.

Curos Sec.

Formation and Proposition. Chlorine gas is passed through terebete with mount and exposed to diffused day-light, as long as any of it is abserted. whereuped hydrocaleric acid gas is abundantly evolved, so that the house manufacture terreterie is liable to burst, unless it be frequently together.— The compound a last obtained, together with chlorinated oil of turpestus, when moving gas a passed may all if turpestus (p. 248).

Consumess when half of sp. gr. 1 36 at 156°, refracting power=1:5294.

and he retained power. Has a peculiar camphorous odour.

		Deville.
		mean.
23 0	120	43.79 43.67
4 C	142	51.83
12 H	12	4.38 4.73
СэС::Нп	274	. 100.00

Isomeric with chircinated oil of turpentine.

Quadrichleroterebene blackens when heated, gives off a large quantity of hydrochloric acid gas, and yields a colourless distillate consisting of aqueous hydrochloric acid gas, bichloroterebene, hydrochlorate of tenbene, and undecomposed quadrichloroterebene, while charcoal remains behind. If the heat be quickly applied, the distillate is red, blue, and ultimately black, and contains a large quantity of hydrochlorate of terebene: 2C²⁰Cl⁴H¹²=20C+C²⁰H¹⁶,HČl-7HCl. (Deville.)

Oxychlorine-nucleus C²⁰ClH²O⁶.

Chloropianyl.

 $C^{so}ClH^sO^s = C^{so}ClH^sO^s,O^s.$

ANDERSON. Ann. Pharm. 98, 47.

Chloromeconin, Hydrure de chloropianyle. (Gerhardt, Traité, 4, 1049.)

Formation and Preparation. When chlorine gas is passed into a cold-saturated aqueous solution of opianyl, an abundant crop of crystals quickly separates, consisting of chloropianyl, which may be purified by recrystallisation from alcohol. - It is likewise produced when dry chlorine gas is passed over melted opianyl.

Properties. Colourless needles, which melt at 175° and sublime un-

decomposed at higher temperatures.

				Anderson.				
20 C	120.0	••••	52.51	*******	52.45			
9 H	9.0	••••	3.93		4.24			
Cl	. 35.5		15.53		15.17			
8 O	64.0	••••	28.03		28.14			
C2ºC1HºO6	228.5		100.00		100.00			

Decompositions. Dissolves in cold oil of vitriol, assumes a greenish blue colour when heated therewith, and on subsequent addition of water deposits brown flocks which dissolve with red colour in alkalis. - It dissolves with red colour in nitric acid, and is decomposed by heating.

Combinations. It dissolves sparingly in cold, somewhat more freely in boiling water,—in alkalis to about the same amount as in water, and without decomposition.

It is soluble in alcohol and in ether.

Oxychlorine-nucleus C20Cl3H11O2.

Terchlorothymol.

C20Cl3H11O3.

LALLEMAND. (1856.) Compt. rend. 43, 376; N. Ann. Chim. Phys. 49, 158; Ann. Pharm. 101, 123, and 102, 122.

Thymollrichloré.

Formation (p. 411).

Preparation. Chlorine gas is passed into thymol in diffused daylight—care being taken to avoid too much heating—till the thymol has absorbed a quantity of chlorine equal to § of its weight. On leaving the product to stand, long yellow needles are formed, which ultimately care it to solidify: they may be purified by expressing the remaining liquid and recrystallising from ether-alcohol.

Lemon-yellow, oblique rhombic prisms, which melt at 61° and have an intoxicating odour.

The compound decomposes at 180°. - Heated with oil of vitriol to 100°, it is converted into a colourless liquid, which floats on the oil of vitriol, solidifies on cooling, and, after solution in aqueous potash, precipitation with hydrochloric acid, and drying, forms silky, tale-like flocks. This substance has at first an agreeable odour of benzoin, melts at 45, and distils without decomposition at 250°; it dissolves in ammonia and forms a salt, crystallising in slender needles,—whence it is probably terchlorocarbolic acid; (xi, 181) with which it appears to agree in conposition.

Oxychlorine-nucleus CoCloHOO.

Quintichlorothymol.

C20Cl5H9O2.

LALLEMAND. (1856.) Compt. rend. 43, 376; N. Ann. Chim. Phys. 48, 158; Ann. Pharm. 10, 123, and 102, 123.

Thymol pentachlors ou quintichlors.

Formation (p. 411).

Preparation. When thymol is exposed for a considerable time to the action of dry chlorine gas in bright daylight, a reddish yellow glatnous oil is formed, in which, after a while, crystals of quintichlorothymal make their appearance; they may be purified by recrystallisation from ether.

Properties. Colourless, very hard crystals, having the form of terchlorothymol (according to another statement of Lallemand, it has the form of thymol), melting at 98°, and containing 55 p. c. chlorine (calculation -

Decomposes at 200°, giving off hydrochloric acid gas and propylese gas (CoHo), while a solid product (terchlorotoluenol) collects in the neck of the retort, and charcoal remains behind:

2 C20H9Cl5O2 = C14H5Cl3O2 + C5H6 + 7HCl + 2CO + 18C.

In one experiment, in which very pure quintichlorothymol was heated, the carbo In one experiment, in which very pure quintichlorothymol was heated, the carbo oxide evolved towards the end of the process was mixed with marsh-gas, and the solidistillate, melting at 150°, and crystallising from alcohol in needles, had the composite of the Cl⁴O², and was therefore quadrichlorotoluenol: 2C²⁰H³Cl³O² = Cl³H³Cl³O² = Cl³H³Cl³O³ = Cl³H³Cl³ by passing chlorine-gas over the crystals from ptychotis-oil (p. 411) previously enable him (Ann. Pharm. 93, 269), obtained dark yellow crystals, which were less which alcohol and ether than thymol, and after recrystallisation from hot similar and drying in vacuo, contained 40.26 p. c. C, 3.99 H, 43.09 Cl, and 17-560 Stenhouse deduced the formula C4C8H**Q10.

Oxynitro-nucleus C20XH9O6.

Nitropianyl.

 $C^{20}H^9NO^{12} = C^{20}XH^9O^6,O^2$.

Anderson. R. Soc. Edinburgh Transact. 21, 204; Ann. Pharm. 98, 46.

Nitromeconin. Hydrure de nitropianyle. (Gerhardt, Traité 4, 1049.)

Concentrated nitric acid, the solution giving off red fumes when heated. On diluting with water, bulky crystals separate, which may be obtained pure by washing and recrystallisation from boiling alcohol.

Properties. White needles and prisms, melting at 160° to a transparent liquid, which solidifies in the crystalline form on cooling. Neutral. Formation and Preparation. Opianyl dissolves abundantly in cold

					Anderson.			
	9 H	9	****	3·76 5·85	*******			
-	12 O		-	100:00		-	-	

Decompositions. 1. Heated in small quantities on platinum-foil, it volatilises almost without decomposition, leaving only a small quantity of charcoal; but, if heated in a test-tube, it decomposes suddenly and leaves a large quantity of porous charcoal.—2. With oil of vitriol, it turns yellow, and dissolves to a red liquid when heated.—3. Boiled with ammonia or potash, it forms, without decomposition, a yellow solution which does not deposit anything on cooling or on addition of acids.

Combinations. Nitropianyl dissolves sparingly in cold, somewhat more freely in boiling water: it is insoluble in hydrochloric acid, but

dissolves in cold strong nitric acid, separating in flocks when the solution is diluted. In cold ammonia and potash, it is not more soluble than in

water. It is not precipitated by metallic salts.

It dissolves in boiling alcohol and ether.

Appendix to Nitropianyl.

Meconin-hyponitric Acid.

C20H2NO12.

COUERBE. Ann. Chim. Phys. 50,347, and 59, 141.

Acid hyponitromeconique, Meconinuntersalpetersäure, Meconinsalpetersaure, Nitromeconinsaure.

Formation and Preparation. When the solution of opianyl in nitric acid is exposed to dryness in the water-bath, a fused mass remains, which solidifies in the crystalline form on cooling. It is purified by recrystallisation from water and alcohol. — Anderson (Ann. Pharm. 98, 47) did not obtain it by this process.

ALL PRINCIPLE STREET, SELECTION STREET, OFFICE

Properties. Learning or signify yellow, long, this, four-sidel prime with square rate. Since strong not reserve. Make at 150°.

			Courbe.
5 :	255	50 mm	50-24
1 I	}	3:35	3 -9 5
2	14 —	5 -8 5	6-36
31 I	-	-34	90-40

It is mercous districts with Andrews 's microphery's, to which, however, Andrews ---

Jerumannestian. Sanimes at 29°, with partial decomposition and the older recer assess.— View farmers at mel-act male, it takes fire and barns away.

Limitations. The recognists decome at water, with light yellow colour.

In concentrates seed, a distribute when heated, and crystallises, without abstract, at coming or want the manner a silicated with water, the liquid then becoming concerns. — It distributes trading a silical, with red colours, and is precipitated smallest or want. — With patient, a farmer a warry mindle suit. — It precipitates from only relief values course-cate press. He forms no procedure with the suits of lime, magnetic, and marrows in shallow with pallow colours, and forms a colourious solution is

Server remains Co X'H'DO'.

Binitrothymol.

 $C_{\mathbf{z}} \Xi_{\mathbf{z}} \chi_{\mathbf{z}} O_{\mathbf{z}} = C_{\mathbf{z}} Z_{\mathbf{z}} H_{\mathbf{z}} O_{\mathbf{z}}.$

Lattiewakin 1856. Compt. rend. 43, 376; abstr. Ann. Pharm. 101, V. Ann. ichm. Figs. 49, 152.

Thomas innum Acide innumchymque, Dinitrothyminsture.

When him sail is sirwly dropped into sulphothymolic acid, or into a selection of a sulphositymate, the liquid becomes slightly warm and deposits a realist oil which sion solidifies.

Orretale wie ein melt at 55%.

Name to have and converts it into ternitrothymol. — When heated with a rock of and of random it is easily converted into solid binimthymo sie of ethyl.

li ilestives sparingly in water.

With bases it forms salts which crystallise in silky needles, detous at 150°, and dissolve sparingly in water, to which however they imput a strong colour.

Bindrata mate of Potach. - Orange-vellow in the anhydrous rely red in the hydrated, state. Very little soluble in water.

Binitrothyreate of Lead. - Contains 32.7 p. c. oxide of lead, sal is therefore C"H"X"PbO' (calculation = 32.65 PbO). Dissolves 787 sringly in water.

Binitrothymate of Silver is very sparingly soluble in water.

In alcohol and ether, binitrothymol dissolves in all proportions, separating as an oil when the solvent evaporates.

Oxynitro-nucleus C20X3H11O2.

Ternitrothymol.

 $C^{20}H^{11}N^{3}O^{14} = C^{20}X^{3}H^{11}O^{2}$.

LALLEMAND. (1856.) Compt. rend. 43, 376; N. Ann. Chim. Phys. 49, 152; Ann. Pharm. 101, 123.

Thymol trinitré, Acid trinitrothymique, Trinitrothyminsaure.

Formation and Preparation. Binitrothymol is dissolved in oil of vitriol, and a small quantity of nitric acid is gradually added, without allowing the mixture to get hot. On diluting with water, yellowish flocks of ternitrothymol are precipitated, which may be recrystallised from boiling water.

Beautiful yellow needles, which melt at 100°, and decompose suddenly

at a higher temperature.

A mixture of oil of vitriol and alcohol readily converts it into solid

ternitrothymic ether.

Ternitrothymol dissolves sparingly in cold water.

It unites with bases, forming yellow or orange-yellow salts, which detonate at 150°, and dissolve in water more readily than the binitro-thymates. The aqueous solution of ternitrothymate of potash precipitates the salts of the heavy metals.

Ternitrothymate of Lead contains 28.83 p. c. lead oxide, and is there-

fore C20X3H10PbO2 (calculation = 28.86 PbO).

Ternitrothymol dissolves readily in alcohol and in ether.

Primary Nucleus C20H18.

Menthene.

C20H18.

Walter. (1839.) Compt. rend. 8, 913; Ann. Chim. Phys. 72, 87; Pogg. 51, 1, 336; J. pr. Chem. 14, 104; Ann. Pharm. 32, 288.

Discovered by Walter in 1838.

Formation. By distilling peppermint-camphor with anhydrous phosphoric acid or oil of vitriol. — Probably also by heating peppermint-camphor with potassium. (Walter.)

Preparation. Small lumps of anhydrous phosphoric acid are gradually added to peppermint-camphor, as long as heat is thereby produced; the mixture, which separates into two layers, is distilled; and the colourless distillate is twice rectified over anhydrous phosphoric acid $(C^{20}H^{20}O^2 = 2HO + C^{20}H^{18})$.

Properties. Transparent, colourless, thin liquid of sp. gr. 0.851; boiling between 161° and 163°. Has an agreeable peculiar odour (which it appears to lose when it contains water, and to recover by boiling with potash), and a refreshing taste. Vapour-density = 4.94.

				Vol. Density	o
20 C 18 H				C-vapour 20 8·320 H-gas 18 1·247	
C20H18	138	 100.00	 99.3	Menthene-vapour 2 9.567	

According to Kane (Phil. Mag. J. 16, 418; J. pr. Chem. 20, 439), it is Call.—Isomeric with camphin and sebacin.

Decompositions. 1. Menthene, when set on fire, burns with a bright, smoky flame.—2. Dry chlorine colours it green, with rise of temperature and evolution of hydrochloric acid, finally yellow, and converts it into pentachloromenthene.—3. With bromine, it acquires a violet, with iodine, a red colour.—4. It is not decomposed by cold concentrated nitric acid; with the hot concentrated acid, it turns green, with evolution of nitrous and carbonic acids, then red, floats at first upon the acid, but ultimately mixes with it, forming a peculiar acid (C²⁰H¹⁸O¹⁸) together with flocks insoluble in water, and a small quantity of an oil slightly soluble in water. — When menthene is heated with strong nitric acid 10 or 15 times, or as long as nitrous acid continues to escape, the liquid then diluted with water, the precipitated white flocks separated by filtration, the concentrated filtrate repeatedly heated with alcohol to remove undecomposed nitric acid, then dissolved in water, and again evaporated in vacuo, the acid remains in the form of a yellow oil, which contains 42.77 p. c. C, 6.61 H, and 50.62 O (therefore C²⁰H¹⁸O¹⁸), decomposes by distillation, and is soluble in water and in alcohol.—5. Menthene is not altered by cold oil of vitriol or by potassium. (Walter.)

Combinations. With Hydrochloric Acid. — Hydrochlorate of Menthene, C20 HuCl. — Chlormenthose (Laurent, Rev. Scient. 14, 341). — Chlormenthène (Walter). a. Chlormenthène (Löwig.) — Fused peppermint-camphor is distilled from a tubulated retort with pentachloride of phosphorus added gradually and in slight excess; the chlorophosphoric acid (terchloride of phosphorus, according to Walter), which first passes over, is removed; and then the yellow oil which passes over at a higher temperature is collected: this oil is washed with cold water, and rectified several times over pentachloride of phosphorus, washed with solution of carbonate of soda and with water, shaken up with chloride of calcium, and dried in vacuo (Gerhardt, N. J. Pharm. 14, 224):

C20H20O2 + PCl5 = PCl3O2 + HCl + C20H19Cl.

It is a very pale yellow oil, lighter than water, boiling at 204°, not however constantly, and with blackening and evolution of hydrochloric acid; has a peculiar odour, like that of nutmeg-flowers, and a refreshing taste.

						Walter.
20	C		120.0	 68.7		68.9
19	H		19.0	 10.8		10.5
	Cl		35.5	 20.5		20.9
C20	HI	HCL	174.5	100.0	To heart	100.3

According to Walter, it is chloromethene, C²⁰H¹⁷Cl; according to Kane (*Phil.* Mag. J. 16, 418), C²¹H¹⁹Cl; according to Gerhardt (*N. J. Pharm.* 14, 224), C²⁰H¹⁹Cl.—It is not yet, however, absolutely proved to be hydrochlorate of menthene, (Schwanert.)

The chlorine-compound when set on fire, burns with a smoky greenedged flame. With cold oil of vitriol it acquires a blood-red colour. Heated with potassium, it is violently decomposed, with formation of chloride of potassium; if the action takes place in the cold, the metal becomes covered with a brown crust. It is not altered by alcoholic potash even at the boiling heat.

The chlorine-compound dissolves sparingly in water, easily in alcohol

and wood-spirit, very easily in ether and in oil of turpentine.

Menthene is insoluble in water. With a small quantity of alcohol or ether, it forms a turbid mixture; with large quantities, a clear mixture. It dissolves with moderate facility in wood-spirit, very easily in oil of urpentine.

Sebacin.

C20H18

T. Petersen. (1857.) Ann. Pharm. 103, 187; abstr. Chem. Centr. 1857, 907; J. pr. Chem. 73, 72.

Formation. By dry distillation of sebate of lime mixed with excess of lime.

Preparation. Sebate of lime, mixed with excess of lime is subjected to dry distillation, whereupon a mixture of propionic aldehyde, cenanthol, and a small quantity of benzene passes over, and finally solid sebacin, which adheres to the sides of the receiver and the neck of the retort: more of it is obtained on leaving the liquid products of the distillation at rest. The product is purified by solution in oil of vitriol, precipitation by water, and recrystallisation from alcohol.

Properties. Solid fatty mass; crystallises from alcohol in nearly colourless laminæ which easily cake together. Melts at 55°; volatilises above 300°. Lighter than water. Inodorous. Tasteless.

Dried over o	il of	vitr	iol.	Petersen.	
20 C 18 H				86·70 13·28	
C20H18	138		100.0	 99.98	

Dissolves in oil of vitriol with red colour, and is precipitated in its original state by water. Scarcely altered by nitric acid or caustic potash.

Insoluble in water, easily soluble in alcohol and ether.

Camphin.

C20H18.

CLAUS. J. pr. Chem. 25, 264.

Formation. By distilling common camphor with iodine.

Preparation. The impure camphin obtained in the preparation of colophene from camphor (p. 280), is agitated with mercury to remove iodine, then distilled per se to remove colophene, camphor, and campboreosote, then shaken up with potash-ley, and repeatedly rectified over potash-lime, as long as the distillate retains iodine. The last trace of iodine may also be removed by setting it aside over potassium, and rectifying.

Properties. Thin colourless oil of sp. gr. 0.827 at 25°. Boils at 167° — 170° under an atmospheric pressure of 28 inches. Odour agreeable, like that of mace, but at the same time recalling that of turpenties.

		-				Chus.
20 C	120	86.96	18 C	108	 87-10	
18 H			16 H			
C20H18	138	100 00	C20H16	124	 100-00	 99-85

Claus is undecided between these two formulæ. According to the first, camphin is isomeric with menthene (p. 445); according to the second, with campholene (xiii, 351).

— According to Gerhardt (Traité 3, 694), camphin is perhaps impure cymene: the formula of cymene requires however 89.5 p. c. C and 10.5 H.

Decompositions. 1. Camphin, when set on fire, burns with height very smoky flame. — 2. It absorbs dry chlorine, with rise of temperature and evolution of hydrochloric acid gas, and forms chlorinated products, which are thicker in proportion as they contain more chlorine. When chlorine gas evolved from 4 ounces of common sult is passed

When chlorine gas evolved from 4 ounces of common salt is passed through 10 grammes of camphin, and the excess of chlorine is removed by a current of air, a transparent, colourless oil is obtained, of the thickness of clive-oil, sp. gr. 1·19 at 21°, containing 47·25 p. c. C, 5 d H, and 46·7 Cl (press-errors in the memoir render it impossible to recalculate the numbers with the new atomic weights: Kr.); and, according to Chans, it is Cli*Cli*Hi. This oil is resolved by heat, like quadrichloroterebear (p. 440), into hydrochloric acid and chlorinated oils; heated with alcoholic potash, it yields chloride of potassium and a chlorinated in sunshine it absorbs an additional quantity of chlorine gas, forming chlorinated chlorocamphin, which is a colourless, viscid, neutral manhaving the thickness of turpentine, and containing 33·1 p. c. C, 3·0 H, and 63·9 Cl, whence Claus calculates the formula Cli*Cli*Hi.

3. By bromine, camphin is attacked more violently than by chlorise, and is converted, with effervescence, evolution of hydrobromic acid, and brown colour, which soon disappears, into a brominated oil. — 4. It is solves iodine with rose-red to brown colour, and resinises after a while with evolution of hydriodic acid. — 5. Dilute nitric acid acts slightly as

camphin; the concentrated acid colours it dark red at ordinary temperatures, with effervescence and evolution of red vapours, and forms after a while, with decolorisation, an azotised oil having an odour of cinnamon. Fuming nitric acid converts camphin into a thick red oil, soluble in potash.—6. Camphin, shaken up with oil of vitriol, colours it yellow, but otherwise remains unaltered.—Heated with fuming sulphuric acid, it turns brown and thickens, gives off sulphurous acid, and distils partly unaltered.—7. Resinises in contact with pentachloride of antimony.

Combinations. Camphin dissolves in alcohol, ether, oil of turpentine, and rock-oil; not in water, weak alcohol, potash-ley, or dilute acids, not even in strong hydrochloric acid. It absorbs a small quantity of hydrochloric acid gas. (Claus.)

Appendix to Camphin.

Camphoresin C20H12?

CLAUS. J. pr. Chem. 25, 264.

The residue left on distilling camphor with an equal quantity of iodine (p. 280), consists of camphoresin with small quantities of charcoal camphin, colophene, camphocreosote, and iodine.

Properties. Solid, black, very brittle resin, resembling asphalt, and having a glassy lustre, easily rubbed to a black powder; fracture con-

choïdal. Melts easily. Tasteless and inodorous.

According to Claus, it contains, when not quite pure, 88.88 p. c. C, 8.39 H, and
2.0 I, and is therefore C²²H¹². (Claus.) It probably likewise contains oxygen, and,
as it was produced from camphor, it is more probably C²⁰H¹². (Gm.)

Decompositions: Camphoresin when boiled, gives off white vapours smelling of creosote. — It takes fire when heated, and burns with a bright flame, leaving a tumefied charcoal, which colours an alcohol-flame green when ignited therein. — By dry distillation, it yields small quantities of camphin, camphocreosote, colophene, and lastly oil-gas and resin, and leaves a residue of charcoal.

Combinations. Camphoresin is insoluble in water and in aqueous alcohol; but absolute alcohol and ether, oil of turpentine and camphor, dissolve it, leaving however a residue of charcoal: the solutions, after agitation with animal charcoal, exhibit a light green iridescence; the solution in rock-oil has a blue iridescence after agitation with animal charcoal.

Peppermint-camphor.

 $C^{20}H^{20}O^2 = C^{20}H^{18}, 2HO.$

GMELIN. (1829.) Handb. Aufl. iii, 2, 408.

DUMAS. Ann. Chim. Phys. 50, 232; abstr. Ann. Pharm. 6, 252.

BLANCHET & SELL. Ann. Pharm. 6, 293.

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Living Let were 14 141.

Information of Aminerougher, Steergees of Peppermistral, all Information in terminal latter to terminate lightness. Latterning

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<u>-</u>			5.4 475	

Commission in a Defect

Figure 1 with a smoky flame of the seef freed peppermint-campbe.

A With the solution with a smoky flame of the seef freed peppermint-campbe.

A With the it acquires a fine of the solution, which is a solution, which is a solution, which is a solution, which is a solution of the solution.

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A solution of the solution.

rated with 2 pts. of oil of vitriol, it forms a semi-fluid mass of fine bloodred colour, from which nearly all the peppermint-camphor separates again on saturation with alkali; the blood-red mixture heated on the water-bath yields menthene floating on a thick red liquid. On saturating this liquid with potash, and precipitating the resulting sulphate of potash with alcohol, the solution yields by spontaneous evaporation, an oil, which, after washing with water, solution in ether, and evaporation of the ethereal solution, contains 81.3 p. c. C, 11.1 H, and 7.6 O (corresponding to the formula C20H19O, according to Walter, and to the formula CreHinO, according to Laurent, who called it menthase), -also a shining salt containing 37 p. c. C and 6.8 H. (Walter.)—When strongly heated with oil of vitriol, it gives off sulphurous acid, first with brown colouring, afterwards with carbonisation. (Gmelin, Walter.) - 8. Heated with anhydrous phosphoric acid, it is resolved into water and menthene (p. 445). - 9. Pentachloride of phosphorus added to fused peppermint-camphor, produces great heat and evolution of hydrochloric acid, and colours the camphor blue, rose-red, and finally dark red: the mixture yields by distillation, chloromenthene and terchloride of phosphorus (Walter), chlorophosphoric acid and hydrochlorate of menthene. (Gerhardt, N. J. Pharm. 14, 224.) - 10. Potassium oxidises slowly in fused peppermintcamphor, the mixture acquiring a doughy consistence when heated. -The doughy mass separates, on addition of water, into two layers, the upper consisting of aqueous potash having a red colour, the lower probably of menthene mixed with peppermint-camphor. - 11. It is not altered by hydrate of potash. (Walter.)

Peppermint-camphor dissolves sparingly in water. — The solution in boiling water becomes turbid on cooling. (Gmelin.) — It dissolves readily in alcohol and ether (Dumas, Walter); easily in volatile oils (Dumas), less easily in oil of turpentine (Walter), in wood-spirit and bisulphide of carbon. (Walter.) — It does not crystallise from a hot solution in alcohol or ether-alcohol. (Blanchet & Sell.)

Appendix to Peppermint-camphor.

1. Crude Oil of Peppermint.—Essence de menthe poierée.— The oil obtained by distilling peppermint, Mentha piperita, with water, is a mixture of peppermint-camphor with a liquid oil not well examined.— The crude oil has generally an acid reaction. (Zeller.)— The dry flowering plant yields 1.25 p. c. oil. (Martius, Repert. 39, 243.) The fresh plant yields the same quantity of oil and of the same properties, whether distilled with steam or over the open fire; but the dry plant yields 1½ times more oil by distillation over the open fire than by steam distillation, and the oil obtained by the latter process is specifically lighter and less coloured than that yielded by the former. When the oil obtained from the dried plant by distillation over the open fire, is rectified with steam, oil of sp. gr. 0.31 passes over, and there remains a portion, which, after rectification over the open fire, exhibits a sp. gr. of 0.93; hence the specifically lighter oil contained in the fresh plant appears to be changed into the heavier oil by drying. (Geiseler, N. Br. Arch. 86, 151.)

Oil of peppermint is limpid, pale yellow, yellow-green to brownish (Pfaff; Zeller, Stud. über. äther. Oele, Landau, 1850); it has a peculiar

odour, and a strong burning taste, but at the same time cooling, like that of camphor (Pfaff); the American oil is less burning. (Bley, Br. Arch. 39, 51.) Sp. gr. 0.92 (Pfaff); 0.89 to 0.92 (Zeller); of the American oil, 0.84 (Bley); 0.907 (Brandes); 0.9083 (Kane); of the oil separated from peppermint-camphor by rectification, 0.8998 (Kane); of English oil, 0.9068 at 18° (Chardin); French, 0.914 at 25° (Chardin); German, 0.9098; rectified, 0.9024 (Martius); 0.86 (Bley); 0.908 at 20° (van Hees, N. Br. Arch. 61, 18.). Boiling point between 188° and 193°. (Kane.) — Contains 75°1 p. c. C, 13°4 H, and 11°5 O (Göbel); mean, 78°5 p. c. C, 11°0 H, and 10°5 O (Blanchet & Sell, Ann. Pharm. 6, 293); mean, 76°66 p. c. C, 12°15 H, and 11°19 O; the first tenth which passes over in rectification, perhaps containing oil of turpentine, contains 78.42 p. c. C, 11.86 H, and 9.72 O (Kane, Lond. Ed. Mag. J. 13, 440; J. pr. Chem. 15, 159), whence Blanchet & Sell deduce the formula C¹²H¹⁶O, and Kane deduces the formula C²¹H²⁰O³.

Oil of peppermint treated with chlorine acquires a turbid, whitish aspect. (Bley.) It dissolves iodine, without evolution of vapour or rise of temperature, acquiring a yellowish to red-brown colour and viscid consistence. (Zeller.) The darker colour disappears on addition of water. The oil does not undergo any alteration of odour. (Flaschof, Br. Arch. 33, 225; Winckler, Repert. 32, 271.) It forms with iodine, a thick magma (Guyot J. Hist. phys. 5, 230); with iodine dissolved in iodide of potassium, it does not form any solid product corresponding to the anisoin of oil of anise. (Will. Ann. Pharm. 65, 230.) With bromine, it assumes a lemon-yellow colour, becoming lighter on addition of water. (Bley.) — With concentrated nitric acid, it forms, with great hissing and rise of temperature, an unctuous mass having an odour of pitch, and depositing a brown resin on addition of water (Bley); ordinary nitric acid colours it purple-red to reddish brown, and thickens it, when heated, at the same time giving off a large quantity of gas. (Zeller.)-With oil of vitriol, it turns brown and acquires the thickness of a balsam (Zeller), without losing its odour. (Bley.) — By chromate of potast and sulphuric acid, it is partially thickened, and coloured yellowish brown, ultimately greenish brown. (Zeller.) — When hydrochloric acid gas is passed into it, or when it is treated with the aqueous acid, it acquires a purple-red colour. (Davy.) — Mixed with ammonia (alcoholic, aqueous, or gaseous? Gm.) it gradually loses the odour of peppermint and of ammonia, and becomes turbid, depositing indistinct flocks. (Boullay, N. J. Pharm. 5, 336.) — Distilled with chloride of lime, it yields chloroorm; with hypobromite of lime, bromoform. (Chautard, Compt. vend. 33, 671 and 34, 485.) — It decolorises finely divided sulphide of lead, and by the action of the ozone contained in it, converts that compound into sulphate. (Williams, N. Phil. Mag. J. 5, 536; J. pr. Chem. 59, 504.) — Boiled with nitroprusside of copper, it yields a dark deposit and acquires a dark colour. (Heppe, N. Br. Arch. 89, 57.) With finely divided mercuric chloride, it turns yellow, and blackens immediately when heated, whereupon a somewhat purple-coloured oil distill over, together with acid vanours, while caloned and a little charged over, together with acid vapours, while calomel and a little charcoal remain behind. (J. Davy, Phil. Trans. 1822, 360.)
Oil of peppermint is slightly soluble in water. — Fresh peppermint

water, and fresh elder-flower-water mixed in equal parts, form a mixture which soon acquires a blood-red colour, and after two months, deposits a red substance somewhat soluble in alcohol and other. If the water are more than a month old, they do not become coloured. (Recluz, J. Chim. méd. 14, 470.)

It dissolves in 1—3 pts. of alcohol of sp. gr. 0.85, forming a clear solution; with a larger quantity, an opalescent solution. (Zeller.) It dissolves in all proportions of alcohol of sp. gr. 0.815, in 10 pts. of alcohol of sp. gr. 0.868. (Bley.)—It dissolves with turbidity in bisulphide of carbon. (Bley.)

2. Chlorinated Peppermint-camphor.

WALTER. (1839.) Ann. Chim. Phys. 72, 99; Compt. rend. 8, 914; Pogg. 51, 1, 344; Ann. Pharm. 32, 294.

A. Oxide of Chloromenthene. (Laurent, Rev. scient. 12, 341), C²⁰H^{15.5}Cl^{2.4}O². — Chlorine gas washed and dried, is passed in the dark through fused peppermint-camphor as long as hydrochloric acid gas continues to escape; the liquid is then heated on the water-bath to expel free chlorine, then washed several times with water and solution of carbonate of soda, and dried in vacuo, after being shaken up with chloride of calcium. — Yellow oil, heavier than water, not crystallisable, having a peculiar odour, and a taste refreshing at first, afterwards bitter and exciting. — It contains 49·16 p. c. C, 6·52 H, 37·80 Cl, and 6·52 O (Walter); it is probably C²⁰H¹⁵Cl²O². (Gm.) — When set on fire, it burns with a smoky green-edged flame. It is decomposed by heat, giving off a large quantity of hydrochloric acid gas, and leaving charcoal. — It is not altered by chlorine in the dark, but in sunshine it is transformed into the following chlorinated peppermint-camphor. With cold oil of vitriol, it immediately turns red. — It dissolves slightly in water, and in squeous carbonate of soda, easily in alcohol, wood-spirit, ether, and oil of turpentine. (Walter.)

B. Oxids of Chloromenthelane. (Laurent.) C²⁰H^{12.5}Cl^{5.}

Campholic Acid.

 $C^{20}H^{18}O^4 = C^{20}H^{18}O^4$

Delalande. (1841.) N. Ann. Chim. Phys. 1, 120; J. pr. Chem. 23, 390; Ann. Pharm. 38, 337; Repert. 80, 159.
Barth. Ann. Pharm. 107, 249; abstr. J. pr. Chem. 76, 125; Chem. Centr. 1858, 784.

Campholiaure, Acide campholique; Acide bornénique. (Laurent, Rev. scient-14, 366.) Discovered by Delalande.

Formation and Proportion. Complex-vapour is repeatedly part and im, united resource, ever heatest possible lime; the whole is to tissuaway in making water: the figures enturated with acid; and white make around the proportion of the second of the second from the second formation and ether-alcohol. — No gas is evolved to the second of th

Fine armais. Melts at 80°, boils at 250°. Vap

	Delaland
21 C 129	:>3 69 76
	17-53 10:66
49 22	19-54 19-58
(3E40 13)	130-00 100-00
	Vols. Densi
C	Vols. Densi
<u> </u>	20 8-320
<u> </u>	20 8-320 18 1-247

C=H=0* = C=H=0* + 2 HO. (Delalande.)

Desimpositions. I. Distilled with anhydrous phosphoric acid, it yi campbowers will 1833 in which place, read compholic instead of campboric accurate acid gas being probably evolved at the same time (Delaland

2. Fixed with excess of hydroite of potash, it forms a frothy, viscid a of camphilite of potash, which no longer melts with the excess potash out at a higher temperature gives off an aromatic smoke, we can forming accetic or captylic acid. (Barth.)—3. By the dry distriction of its lime-salt, it is resolved into carbonate of lime and campbole which, after rectification, contains \$1.60 p. c. C, 11.61 H, and 6.79 therefore Callador.)—Calculation 82.01 p. c. C, 12.23 H, 5.15 O.

Combinations. Campholic acid is insoluble in water, but imparts it a slight aromatic odour. (Delalande.) With bases, it forms to Campholates.

Campholate of Lime. — Aqueous campholic acid is supersatural with ammonia, the boiling solution is mixed with aqueous chloride calcium, and the white crystalline powder which precipitates is driven the decomposition by dry distillation, vid sup.

			Delaland			
20 C	120	 60.61	·•···	59-97		
18 H	18	 9.09		9.08		
5 O	40	 20.20	•••••	20.82		
Ca	20	 10.10	••••••	10-13		
C20H13C8O4'HO'	198	 100.00		100-00		

Campholate of Silver. — Aqueous campholate of ammonia is mixed with nitrate of silver, and the resulting precipitate is washed and dried. White, curdy flocks.

				1	Delalande.
20 C	120		43.32	*******	43.00
17 H	17	****	6.13		6.23
4 0	32		11.56		12.17
Ag	108	****	38.99		38.60
C20H17AgO4	277		100.00		100.00

Campholic acid is soluble in alcohol and ether. (Delalande.)

Oxygen-nucleus C20H16O2.

Camphoric Acid.

 $C^{20}H^{16}O^{8} = C^{20}H^{16}O^{2}, O^{6}.$

Kosegarten. (1785.) Diss. de camphora et partibus quæ constituunt, Göttingen, 1785.

DÖRFFURT. Abhandl. über den Campher. Wittenberg u. Zerbst. 1793.
BOULLON-LAGRANGE. Ann. Chim. 23, 123; 27, 19, and 221; Crell.
Ann. 1799. 2, 221, and 313.

Висинова. N. Gehl. 9, 332.

Brandes. Schw. 38, 269; Repert. 15, 431; 20, 324; Br. Arch. 9, 167. Liebig. Pogg. 20, 41; Repert. 37, 470. — Ann. Pharm. 22, 50; Repert. 40, 131.

LAURENT. Ann. Chim. Phys. 63, 207; Ann. Pharm. 22, 135; J. pr. Chem. 11, 287. — Compt. rend. 20, 511; J. pr. Chem. 35, 501.

MALAGUTI. Ann. Chim. Phys. 64, 157; Ann. Pharm. 22, 38; J. pr. Chem. 11, 294; J. Chim. méd. 13, 107; abstr. J. Pharm. 23, 74 and 513.—Compt. rend. 41, 625; J. pr. Chem. 67, 277; abstr. Chem. Centralbl. 1855, 874.

Walter. Ann. Chim. Phys. 74, 38; Ann. Pharm. 36, 59; J. pr. Chem.
21, 241; abstr. Repert. 80, 113; Ann. Chim. Phys. 75, 212. —
N. Ann. Chim. Phys. 5, 187; 9, 177; Ann. Pharm. 48, 248; abstr.
N. Br. Arch. 39, 75.

Relating especially to the Isomeric Modifications of Camphoric Acid:

CHAUTARD. Compt. rend. 37, 166; N. J. Pharm. 24, 168; J pr. Chem. 60, 139; Pogg. 90, 622; N. Repert. 2, 565; abstr. Chem. Centralbl. 1853, 636; N. Br. Arch. 76, 168.

Dextro-camphoric acid, Camphersäure, Camphorsäure, Rechts-Camphersäure, Camphylsäure, Acid camphorique, Acid camphique. (Laurent.)—Observed and regarded as camphor by Lemery in 1675 (Cours de Chemie): discovered by Kosegarten in 1785; regarded as benzoic acid by Dörffurt, a view which was shown to be erroneous by Bouillon-Lagrange and Buchholz.

Formation. By prolonged boiling of common camphor with nitric acid. — It was found in an anatomical preparation preserved in oil of turpentine. (Henry, Thoms. Ann. 15, 117; Schw. 31, 361.)

The following a figure of firm a retort with 10—11 with 11 to a find a retort with 10—11 with 11 to a find a retort with 10—11 to 11 to 11 to 12 to 13 to 13

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These in the second reads white crystalline grains on come. These invalue has not hereaftly further beiling; they are difficult to me that the training section however in the crystalline fem. They have a shortly server has a dissolve sparingly in water, forming a section with the main end dissolve sparingly in water, forming a section to the wind selection.—decomposes alkaline carbonates,—which is the wind selection of neutral acctate of lead,—copies with a section of feel,—and produces no alteration in solutions of the section of the secti

White flux-sided lamina, rectangular and arranged like state of sugartent small, six-sided pyramids united in plumose graph little in the rest to the right prismatic system. — Rhombic prismatic with flux-sided accuminations formed by the faces, and the survival with flux-sided accuminations formed by the faces i and u (Fig. 3). In the rest is at 62.5, solidifies in the crystalline form on contrast in the rest at his few temperature (Brandes), with loss of water (Launti).

salithmes at a higher temperature (Brandes), with loss of water (Launt), as camphoric anhydride. (Bouillon.) — Rotatory power 38:873 to the right: weaker after saturation with soda, but increases again on decemposing the soda-salt with hydrochloric acid. (Bouchardt, Compt. rad. 28:319.) — Camphoric acid dissolved in acetic acid exhibits a rotator power of 38 to the right; dissolved in absolute alcohol, 38:6 to 38 to the right. (Biot, Compt. rend. 35, 233; Ann. Pharm. 84, 160.)

Camphoric acid is inodorous (Brandes); has an odour of saffer (Kosegarten); when heated to 37°, it smells like camphor and fat is wise sour; at 100° very pungent. (Brandes.) Its taste is black inclining to acid (Kosegarten and others), sweetish, scarcely acid (Dörffurt.) When taken internally, it passes unaltered into the care. (Bertagnini, Cimento, 1, 363; Ann. Pharm. 97, 248.) Reddens little-Cosegarten.)

	20 C	16	****	8	 61·34 5·62		59·49 8·03		59·73 8·09	 7.96	
i	C201716/08	000		100	100.00	-	100.00	-	100.00	100:00	ì

Decompositions.—1. Heated in a retort, it is resolved into water and camphoric anhydride, leaving a small quantity of charcoal. (Laurent.) When heated above its melting point, it turns brown and froths, and at a higher temperature leaves a small residue of charcoal, and gives off a small quantity of acid empyreumatic water, empyreumatic oil, and a white opaque sublimate of unaltered camphoric acid (Buchholz), of altered camphoric acid, which no longer reddens litmus and is insoluble in water. (Bouillon.) The acid browned by fusion solidifies on cooling into a brown, transparent, non-crystalline, resinous mass. (Brandes.) When thrown on red-hot coals, it volstilises completely, diffusing a dense aromatic vapour. (Bouillon.)—2. When heated in the air, it burns with a bright flame, leaving a small quantity of charcoal. (Brandes.)—3. By repeated distillation with peroxide of manganese and sulphuric acid, it yields acetic acid. (Dörffurt.)—4. It dissolves in cold oil of vitriol, forming a limpid solution from which water precipitates camphoric anhydride; the solution Decompositions. — 1. Heated in a retort, it is resolved into water and solution from which water precipitates camphoric anhydride; the solution heated in the water bath to 45°, gives off a small quantity of carbonic oxide, and at 60° a larger quantity, with violent effervescence, and is converted into sulphocamphoric acid (xiii, 379). In fuming oil of vitriol, it dissolves with yellow to brown colour, likewise forming sulphocamphoric acid. (Walter.) — Distilled with alcohol and oil of vitriol, it yields ethyl-camphoric acid. (Malagnti): with wood-swrit and oil of vitriol. ethyl-camphoric acid (Malaguti); with wood spirit and oil of vitriol, methyl-camphoric acid. (Loir, N. Ann. Chim. Phys. 37, 196; N. J. Pharm. 22, 288.)—5. Heated with syrupy phosphoric acid to 195°, it is resolved into: (1), carbonic oxide; (2), a colourless oil, boiling at 121°, having an agreeable odour with somewhat of a turpentine character, of sp gr. 0.793 at 25°, vapour-density 4.29, and corresponding to the formula C18H18; and (3), a pale yellow oil boiling at 250°, having an agreeably aromatic odour, of sp. gr. 0.889 at 21°, of composition not yet determined. (Galle, Epist. Communication.) — 6. Distilled with pentachloride of phosphorus, it yields camphoric anhydride, hydrochloric acid, and chlorophosphoric acid. (Gerhardt & Chiozza, Compt. rend. 36, 1050; Ann. Pharm. 87, 290; J. pr. Chem. 59, 452; Instit. 1853, 255.) - 7. Potassium and sodium decompose camphoric acid at temperatures far below its melting point, without emission of light, leaving a residue of alkali and charcoal. (Gay-Lussac & Thénard.)—8. The lime-salt when distilled yields phorone (xiii, 342). (Gerhardt & Liès-Bodart, Compt. rend. 28, 506; Ann. Pharm. 72, 293.) According to Fittig (Ann. Pharm. exii, 309), the oil which passes over in the distillation of camphorate of lime, begins to boil at 60°. the greater portion distilling between this temperature and 270°, leaving however a residue. The portion which passes over in fractional distillation between 200° and 205° has the composition of phorone ($C^{18}H^{14}O^{2}$). The portions boiling at lower temperatures did not yield any definite compound. — 9. The soda and potash-salts distilled with an equal weight of perchlorovinic ether (ix, 26), yield a distillate of camphoric anhydride, water, sesquichloride of carbon, carbonic acid, and combustible gases, leaving a residue of hydrochlorate and carbonate of the alkali. (Malaguti.) - 10. Camphoric acid heated for some time to 200° in a sealed tube with glycerin, forms camphorin, which may be extracted by ether from the mass, after cooling and mixing with excess of aqueous carbonate of potash, and remains, after evaporation of the ether, as a viscid neutral mass, soluble in ether, and resolved by oxide of lead

more and timeres in 400 year of 5002 water (D'rffurt), 200 (Koogures in 400 year), 200 (Koogures in 400 year), 200 (Koogures in 400 year), 201 armore, and in 24 pts. of boiling water Director. If Languages in 300 years 100 (Bouillon).—It discovers in 400 year to 117; in 70 pear at 25°; in 61°5 pts. at 82°5°; in 61°5 pts. at 82°5°; in 61°5 years 100° in 40° years 100° year

le dissilves victione elementic de selvic cold. (Laurent.)

Composition — Campiners and forms with bases, bibasic (neutral) mile — The MC. and most easily prepared.— The camphorates are instituted have presently a rather bitter taste; yield when heated, as empyroumants oil, with a residue of charcoal (the lime-salt yielding positions the lead-salt example ric anhydride), and burn in the air with a line, it sometimes while a red frame. They are decomposed by sulphure, invitate their axis are a frame. They are decomposed by sulphure, invitate their axis are a said, and are but slightly soluble in water. Campioners axis with a bases, yields peculiar salts isomeric

With the manufactures with mail.

Companyous of Ammittin — Bibasic. — Dry ammonia-gas is passed twee camputatic still and the excess of ammonia is expelled by passing the latter the product at 100°. (Malaguti.) Separates from its solution by experimental as a saline film composed of slender needles. For the Tasteless and incolorous. (Malaguti.) Has a rather bare used for the ammittistic (Brandes). Reacts slightly acid. Melts when better from the first ammonia with intumescence, and volatilises partly indicate the sample of ammonia with intumescence, and volatilises partly indicate the first and camphoric anhydride. (Laurent.) Dissolves readily in water. Malaguti : in 100 pts. of cold water (in a much smaller quantity, according to Brandes, in 3 pts. of boiling water; the solution gives of amminia when heated. (Bouillon.) Easily soluble in alcohol. (Bouillon)

\$ NH40			
C*H: NII', O'	234	 100.00	 100.00

b. Four-thirds basic. — By saturating aqueous camphoric acid with bicarbonate of ammonia, small, very white prisms are obtained, which melt somewhat above 100°, have a slightly sour taste, and redden litmus. Dissolves readily in cold water. Dried at 100°, it gives off 19 p. c. water. (Malaguti.) — (18 At. HO=19.5 p. c.)

Dried at 100°.					Malaguti
60 C	360		53.89		52.84
60 H	60	••••	8-98		8.08
4 N	56	••••	8.38	•••••	8.51
21 O	192	••••	28.75	•••••	29-67
3C30H1cOs + 4 MH3	668		100.00		100.00

According to Gerhardt, it is perhaps monocamphorate of ammonia, C²⁰H¹⁵(NH⁴)O³ (containing in the crystallised state 6 At. water, by calculation 19¹⁹ p. c. Aq.), on which hypothesis, the formula of the dry salt requires 55¹³ p. c. C, 8¹⁷ H, and 6¹⁶ N. (*Traité* 3, 702.)

Camphorate of Potash. — Bibasic. — Obtained by neutralising aqueous camphoric acid with potash a carbonate of potash. — Small six-sided prisms (Bouillon, Buchholz); needles grouped in tufts. (Brandes.) — The salt prepared with camphoric anhydride and potash forms broad pearly laminas. (Malaguti, p. 458.) Tastes faint saline, aromatically bitter. Melts when heated, turns brown, and at higher temperatures hardens to a white mass having a sharp taste. (Buchholz, Bouillon.) — It dissolves in 100 pts. of cold, and in 4 pts. of boiling water; also in alcohol (Buchholz, Bouillon); deliquesces slowly on exposure to the air and dissolves in a very small quantity of water. (Brandes.) The less soluble salt is perhaps the monopotassic and the more soluble the bipotassic camphorate. (Gerhardt, Traité, 3, 703.)

			В	randes.
	2 KO C ²⁰ H ¹⁴ O ⁶			32.5
- 8711	C20H14K2O8	276.4	 100.0	-

Camphorate of Soda. — Bibasic. — Aqueous carbonate of soda is saturated at the boiling heat with camphoric acid; the solution is evaporated to dryness; the residue dissolved in alcohol; and the crystals which separate from the syrupy solution after standing for a long time, are collected and dried over oil of vitriol. (Kemper, Epist. communication.) — Limpid indistinct crystals. (Bouillon.) Needles and cauliflower-like masses. (Brandes.) Swells up when heated, melts, blackens, and gives off vapours which burn with deposition of soot. It deliquesces in the air (Brandes, Kemper); dissolves in 200 pts. of cold, and 8 pts. of boiling water (Bouillon); in 80 pts. of cold alcohol. (Brandes.)

			Brandes.	Kemp.	
2 NaO C ²⁰ H ¹⁴ O ⁶				24.88	
C20H14Na2O8	244	 100.00			

Camphorate of Baryta. — Bibasic. — Obtained by boiling camphoric acid with baryta-water. — Thin laminum or needles. Taste, rather acid, bitter (Bouillon), saline. (Brandes.) Gives off 11.87 p. c. water when heated (Brandes) (by calculation, 6 At.=12.5 p. c. Aq). Dissolves in 1.8 pt. water at 19°, and in 600 pts. of boiling water. (Bouillon.)

Dried at 100°				Brandes.
2 BaO	153 182		45.67 54.33	42.66
C20H14Ba2O8	335	***	100-00	

Camphorate of Strontia. — White, translucent, crystalline laminæ having a rather bitter saline taste, and still more soluble in water than the baryta-salt. (Brandes.)

Camphorate of Lime. — a. Polybasic? — White, non-crystalline, slightly bitter, perfectly neutral laminæ, which crumble when exposed to the air, are nearly insoluble in cold water, soluble in 200 pts. of boiling water, insoluble in alcohol, and contain 43.6

y. z. CaO or CaO.CO^{E z}. 39 pts. camphoric acid (hyp. anhydrous?), and 7 p.c. water.

Brazillou. — The first two determinations cannot be reduced to any probable calculation. The amount of water would correspond to 2 At. for bibasic camphorate of trans.

The second of the calculations are supplied to 2 At. for bibasic camphorate of trans.

t. Se amount of water would correspond to 2 At. for bibasic complorate of s. St.

5. Expense. — 180 pers. of examphoric acid dissolve 56 pts of carbonate of the complete of t

of lime 2 Az. CaO,CO²=50 ptx.), and yield the following salt, orm when neutralised with lime-water. (Brandes.) Rhombic prime. Bernhard:) Has a slightly saline, bitterish taste; with astringent americans: reckless frames; and when heated, makes a hissing noise, becomes querie and brown, giving off water and empyreumatic oil. Burkhard. For the iccomposition by dry distillation, see page 458.

Asigórus.	Brandes.				
2 CaO 56 . C=H-O 182					
C*H*C*O* 238					
Crys		Brandes.			
2 C=O	56	14-67		14.54	
Call-O	182	47-64	****	47.96	
16 BO	144	37-69		87.50	

Campionate of Magnesia. — Bibasic. — Translacent bitter prises, which commin 17 p. c. MgO, CPH*Mg*O*=180 p. c. MgO), become moist on exposure we are not dissolve in 6.5 pts. of water at 2.5°. Brandes.) — When camphoris acid is benefic with water and excess of magnesia alba, the filtrate yields by evaporation. Under apparently similar circumstances, crystals varying in their amount of water, whilst another part of the salt effloresce. — The crystals effectsee in the air, and give off their water of crystallisation below 120°, without suffering any further alteration at 200°. There which commin 15 At. water, dissolve in 2.5 pts. water at 20°. (Kemper, Figs. 2000. — Camphorate of magnesia dissolves in 54 pts. of absolute alcohol, at 3.7° Brandes; it is insoluble in cold alcohol, and dissolves with decomposition in hot alcohol. (Bouillon.)

Crystals.				1	Kemper. mean.
2 MgO	40	••••	11.20		11.21
CaH:-O-	182		50-98		
12 HO	135	•	37.82	•••••	38-04
C*H~Mg*O* + 15HO	357		100-00		
Crystals.					Kemper.
2 McO	40	••••	9.13		9.04
Ca_H20					
24 HO	216	••••	49.32	•••••	49.82
C3H3N5O4 + 24 HO	438	••••	100.00		
Crystals and efforesced s	ell.			1	Kemper.
2 MgO 40 .		8-6	iO	8.5	8 8-91
C*H.*O* 182 .		39-1	4		
: HO 243 .		59.9	R	50.4	0

[&]quot;femolosic." When the aqueous solution of the bibasic salt is heated, the acid separated from an equal quantity of it, and the solution left to cool, it phoric acid, but does not form a monobasic salt. (Kemper.)

Camphorate of Alumina. - Obtained by boiling hydrate of alumina with camphoric acid and water, and evaporating the filtered solution .-White powder, having a harsh, sour, rather bitter taste, capable of reddening litmus, permanent in the air, soluble in 200 pts. of cold, and in a smaller quantity of hot water, sparingly soluble in cold, easily in hot alcohol. (Bouillon.)

Uranic Camphorate. - Aqueous uranic salts form a yellowish precipi-

tate with camphorate of potash. (Brandes.)

Camphorate of Manganese. - By boiling carbonate of manganese with camphoric acid and water, a solution is produced, which, when left to evaporate, yields crystalline laminæ very soluble in water. (Brandes.) Alkaline camphorates do not precipitate manganous salts. (Brandes.)

Camphorate of Zinc. - Obtained by decomposing the aqueous solutions of the alkaline camphorates with zinc-salts. White precipitate.

(Brandes.)

Stannous Camphorate. - White precipitate produced by decomposing the aqueous solution of an alkaline camphorate with protochloride of tin. (Brandes.) The aqueous solution of neutral camphorate of magnesia forms with protochloride of tin, a precipitate which disappears at first, but afterwards becomes permanent. (Kemper.)

Camphorate of Lead. — Bibasic. — Obtained by precipitating aqueous

nitrate of lead with camphorate of potash (Brandes); or by boiling the aqueous solution of camphoric acid with neutral acetate of lead, and washing the resulting precipitate with hot water. (Liebig, Boucsein.)—White precipitate insoluble in water. (Brandes.) When subjected to dry distillation, it gives off camphoric anhydride, together with a small quantity of phorone, and leaves oxide of lead, coloured grey or black by separated charcoal. (Boucsein, N. Br. Arch. 83, 277.)

20 C 120·0 29·60 29·29 14 H 14·0 3·45 3·48 6 O 48·0 11·85 12·55 2 PbO 223·4 55·10 54·68	Al 100°.	. Comment			Boucsein.		
6 O 48·0 11·85 12·55	20 C	120.0		29.60		29.29	
	14 H	14.0		3.45		3.48	
2 PbO 223.4 55.10 54.68	60	48.0		11.85		12.55	
	2 PbO	223.4	****	55.10		54.68	

Contains 54'5 p. c. oxide of lead.

Ferric Camphorate. - Obtained by precipitating aqueous ferric salts with aqueous camphorate of potash. - Light brown, bulky precipitate insoluble in water. (Brandes.)

Camphorate of magnesia does not precipitate nitrate of cobalt. (Kemper.)

Camphorate of Nickel. — By precipitating aqueous nickel-salts with aqueous camphorate of potash. Greenish white precipitate, sparingly

soluble in water. (Brandes.)

Camphorate of Copper. — Bibasic. — Produced by precipitating aqueous sulphate of copper with camphorate of potash (Brandes); with neutral camphorate of ammonia (Malaguti). — Light green precipitate, which, when carefully heated, becomes sky-blue, and at a higher temperature, dark green, then white, and suddenly black, burns with bright flame and waxy odour, and leaves cupric oxide. It is nearly insoluble in water, and forms a crystalline compound with ammonia.

Brandes. Malaguti. 1000 - 1014 - 303 1000 - 1819 - 697 73-4 ... 30-3 ... 29-6 30-01

Normal Providence - Flow : / - By precipitating squeous mer-Harf. V. In Link 5, 3000.—White powder, greyish white there have Brankes a litterish taste (Harff). Turns grey is said in the Wind beautiful a take it sublimes with very slight alteration. statistics with rester it a time it should shall be sufficiently altered by cold oil of the first time of virtual lecomposes it, with separation of camphoric it. If case separates there mercures oxide. (Harff.)—It is included to be sufficiently insoluble, according to Brandes).—By the province of it is highly is partly converted into mercuric camputate.—It in the with armining, forming basic ammonio-mercurous many trade. These were armining for the (Harff.)

1757	41.5 191	Harff. (9:5 63:9 . 30:5	
C: H - H (70°)	. 3:5	150-0	-

Bis Annumentarius Complorus. — Produced by passing automaticus in water in which mercurius camphorate is suspended. and a gas the water in which mercurius camphorate is suspended.—
here there are there are you let remaining \$1.76 p. c. Hg*O. The melt
said, but the rational in mercury. Leaves charcoal who
remain the rational selection in the said, it leaves a white powder
to the rational selection of amounts
the rational variable of the rational selection water, all shell, and ether

-Dy trecipitating aqueous mertree in tast — White precipitate, having a
little of take, it sublimes partly without
the product of the product sensibly alread
to the product of virild, with separat
to the product of mercuric oxide—
to the product of mercuric oxide—
to the product of the product of service
to the product of the produc

		₽ .
	:-:	4
	• •	
 14.5	•	

- Citabel by pasing the citabel session of th

Camphorate of Silver. — Bibasic. — Obtained by precipitating aqueous nitrate of silver with camphorate of potash (Brandes), with camphorate of ammonia (Laurent). — White precipitate (Brandes), electric (Laurent). — Turns bluish when exposed to light. Melts when heated and burns away, leaving metallic silver. (Brandes.)

			Brandes.	Laurent.
2 AgO				55.4
C20H14Ag2O8	414	 100.0	9.1	

Camphorate of Platinum. — Aqueous camphorate of soda forms with bichloride of platinum a white precipitate, sparingly soluble in water. (Brandes.) Camphorate of magnesia does not precipitate bichloride of platinum. (Kemper.)

Camphoric acid dissolves in alcohol, in ether, and in oils, both fixed and volatile. — It dissolves in ½ pt. boiling, and 1 pt. cold alcohol (Buchholz); in 0.94 pts. alcohol at 8.7°, in 0.89 pts. at 12.5°, in 0.79 pts. at 25°, in 0.59 pts. at 37.5°, and in 0.68 pts. at 62.5°. (Brandes.)

Appendix to Camphoric Acid.

Isomeric Modifications of Camphoric Acid.

- 1. Lavo-camphoric acid. Obtained from the lavo-rotatory camphor of Matricaria Parthenium, L. (p. 350), by boiling with nitric acid, in the same manner as ordinary camphoric acid from ordinary camphor. The acid thus obtained possesses lavo-rotatory power equal in amount to the dextro-rotatory power of ordinary camphoric acid, with which it agrees in all other properties. (Chautard.)
- 2. Paracamphoric acid. Acide racemique camphorique. By evaporating an aqueous mixture of equal quantities of ordinary camphoric and lawo-camphoric acid, crystals are obtained, destitute of rotatory power, but agreeing in other respects with camphoric acid. (Chautard.)

Methyl-camphoric Acid.

 $C^{22}H^{18}O^{6} = C^{2}H^{4}O^{2}, C^{20}H^{14}O^{6}.$

LOIR. (1853.) N. Ann. Chim. Phys. 37, 196; N. J. Pharm. 22, 288;
N. Ann. Chim. Phys. 38, 483.

Methylcamphersäure, Methylencamphersäure, Camphermethylensäure, Acide camphomethylique, Acid methyl-camphorique.

Formation and Preparation. By distilling 2 pts. of camphoric acid with 4 pts. wood-spirit and 1 pt. oil of vitriol, cohobating the distillate twice over the residue, mixing the alcoholic solution of the viscid, brown distillate with water, washing the viscid oil thereby separated wit

water, and leaving it to stand exposed to the air or under water till it solidifies in the crystalline form. The collected crystalline masses are pressed between filtering paper and boiled with water, set aside till they have again solidified in the crystalline form, then collected and dried over oil of vitriol.

Properties. Rhombic prisms belonging to the right prismatic system, having the acute lateral edges truncated, and with 4-sided summits formed by the faces of a rhombic octohedron. Fig. 67 without $p.-u: u=106^{\circ} 30'$; $u: t=126^{\circ} 45'$; $a: u=135^{\circ} 50'$; $a: t=115^{\circ} 25'$; a: a=0 over the obtuse lateral edge of the rhombic prism = $129^{\circ} 10'$; a: a over the acute lateral edge of the rhombic prism = $109^{\circ} 50'$. By rapid evaporation of the ethereal solution, hemihedral crystals are obtained: in that case only the faces a and b appear, and, by the predominance of the b-faces, the crystals acquire the appearance of four-sided tables. Cleavage at right angles to b.

Melting point 68°. - Rotatory power 51.4° to the right. The

alcoholic solution reddens litmus.

C2H4O2, C20H14O6	214	100:00		100-00
8 0	64	 29.99	*******	30.15
18 H	18	 8.41		8.48
22 C				
				Loir.

Decompositions. 1. When heated, it forms without loss of weight a viscid oil, which becomes opaque some hours after cooling; if heated above the melting point, it is resolved into camphoric anhydride, a small quantity of viscid liquid (perhaps camphorate of methyl), and a small quantity of charcoal. — Burns, when set on fire, with a bright fuliginous flame. — 3. By distillation with hydrate of potash, it is resolved into wood-spirit and camphorate of potash.

Combinations. Methylcamphoric acid is slightly soluble in water.—Aqueous or alcoholic methylcamphoric acid is not altered by lime-water or dissolved baryta-salts; it is clouded by baryta-water, but becomes clear again on the addition of a small quantity of nitric acid; with aqueous acetate of lead, it forms a white crystalline precipitate, soluble in excess of the precipitant; with cupric acetate, a crystalline greenish precipitate; it is but slightly clouded by nitrate of silver, but reduces oxide of silver.

Methylcamphoric acid dissolves readily in alcohol, ether, or chloroform,

and crystallises by evaporation of the solvent.

Camphorate of Ethyl-

 $C^{28}H^{24}O^{8} = 2C^{4}H^{5}O, C^{20}H^{14}O^{6}.$

MALAGUTI. (1837.) Ann. Chim. Phys. 64, 152; J. pr. Chem. 11, 294; Ann. Pharm. 22, 32; abstr. J. Pharm. 23, 75, and 513; Repert. 61, 123.

Camphoric ether, Camphernaphtha, camphersäures Aethyloxyd, Campherformester, Camphorate d'éthyle, Ether camphorique.

Formation and Preparation. Ethyl-camphoric acid is subjected to dry distillation; the distillate, which solidifies in the crystalline form, is dissolved in hot alcohol; the solution is left to itself till it has deposited camphoric anhydride; the mother-liquor is precipitated by water; the oil which separates and gradually becomes thicker, is boiled with weak aqueous potash, washed with water, dried in vacuo, and distilled per se; and the distillate is again washed with water, and dried in vacuo.

Properties. Amber-yellow oil, of sp. gr. 1.029 at 16°, and boiling at 285°—287°. Has a strong, unpleasant odour, and a bitter, very disagreeable taste. Neutral.

				1	Malaguti.
28 C	24	100	8.9		9.4
2,C4H5O,C20H14O6	256		100.0		100.0

Decompositions. 1. Turns brown when heated above its boiling point, and leaves a black residue, yielding, however, a distillate of pure camphoric ether. - 2. It requires to be heated before it can be set on campnoric etner. — 2. It requires to be neated before it can be set on fire by a flaming body, and then burns with a quiet, white, strongly fuliginous flame. — 3. With dry chlorine gas, it turns yellow, becomes heated, increases in volume, gives off hydrochloric acid, and forms chlorinated camphoric ether. (Malaguti, Ann. Chim. Phys. 70, 360.) Acetic acid is formed at the same time. — 4. It dissolves in hot oil of vitriol without evolution of sulphurous acid, but does not separate on addition of water, the solution emells like oil of layender — 5. It is not decomp of water: the solution smells like oil of lavender. - 5. It is not decomposed by nitric or hydrochloric acid, even with aid of heat. — 6. When boiled for a very long time with strong aqueous potash, it forms alcohol and camphorate of potash. — 7. It is not decomposed by ammonia.

Combinations. Insoluble in water. — It dissolves in cold oil of vitriol,

and is precipitated in its original state by water. — It dissolves iodine, which can afterwards be only partially separated by heat, without decomposing the camphoric ether. It dissolves bromine, and that substance may be completely expelled from it by heat.

It dissolves in alcohol and in ether. (Malaguti.)

Ethylcamphoric Acid.

 $C^{24}H^{20}O^{8} = C^{4}H^{6}O^{3}, C^{20}H^{14}O^{6}$

MALAGUTI. (1837.) Ann. Chim. Phys. 64, 152; J. pr. Chem. 11, 294; Ann. Pharm. 22, 45; abstr. J. Pharm. 23, 75, and 513; Repert. 61;

Camphovinic acid, Weincamphersäure, Aethyl-camphersäure, Acide camphovinique, Acide camphoéthylique, Acide ethylcamphorique.

Formation and Preparation. 2 pts. of camphoric acid or camphoric anhydride are distilled with 4 pts. of absolute alcohol and 1 pt, of oil of vitriol; the distillate amounting to about half the mixture is cohobated; the residue in the retort is mixed with water; the oil which then separates is washed with water, dissolved in aqueous potash, precipitated

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w invitations and and dissolved in alcohol after washing with vater; the annual is seit in response; and the residue is dried at 180°.

I merce. Limital survey Brild, of sp. gr. 1 '095 at 20'5'. Begin in half at 107'. Her his building paint soon rises, in consequence of decommendate. Has a major point as about, disagreeably bitter but not acid. Leaders limits since time only.

				Malaguti.
I+ [144	_	63-15	 62-55
39 I	24	_	5-77	 8-87
•	64	-	28-03	 28.58
ייי אלי מבי גישה.	225		100-00	 100:00

Intro-completele and is restived by heat into camphoric anhydrisk communion other water, a small quantity of alcohol, and carburettel a resource and its productivel extract with scaler, or by boiling therewith a resonant man is and camphoric other, and by continued boiling with a passions along a its converted into camphoric other and an alkalize samplument.

minimum. Existent pheric acid unites with bases, forming the characteristic structures are said dissolve in aqueous alkalis and are presented to said. The line, baryta, strontia, magnesia, and manufactures are said in water; the alumina, iron, rine, last one party and are exclude or sparingly soluble in water.

Triplemanian of America.—An alcoholic solution of ethyrumnian and is not exite saturated with ammonia, the unneutralist partial of the arid is separated by water, and the filtrate is evaporated.—The sat has an arialize reaction, but does not contain free ammonia.

Filter can be exerted as form.—Aqueous ethylcan phorate of ammosist the contribution of a fixed at the contribution of the con

Fig. sand for a Copper. — By decomposing ethylcamphorate of in n can will subtance of copper, a sesquibasic salt is produced, occurring that water.

Free harrierie acid is slightly soluble in alcohol and in ele-

Chlorinated Camphoric Ether.

 $C^{24}H^{34}C^{14}O^{6} = 2C^{4}H^{3}Cl^{2}O,C^{20}H^{14}O^{6}.$

MALAGETI. (1839.) Ann. Chim. Phys. 70, 360; J. pr. Chem. 18.40. Ann. Phys. 32, 33; N. Br. Arch. 12, 150; Report. 70, 134.

Ch' reamphernaphtha, Campher-Chloroineater, Ether camphorique chloroi.

Prepriation. Camphorate of ethyl is saturated with dry chlorize the excess of chlorine is removed by heating the yellow liquid; and the socied thickish mass is washed, first with weak aqueous potash, the peatedly with weak alcohol, dissolved in absolute alcohol, and evapored in vacuo.

Properties. Limpid, viscid oil of sp. gr. 1.386 at 14°. Has an agreeable odour, and a strong, persistently bitter taste.

				3	Malaguti.
	168		42.6	******	42.1
***************************************	20		5.1	*******	5.4
	142	****	36.0	*******	35.3
***************************************	64	****	16.3	******	17:2
3Cl2O,C20H14O6		-	-		-

Decompositions. 1. When heated, it becomes viscid and then decomposes.—2. Aqueous potash acts upon it very slowly, if at all; by alcoholic potash, it is converted into camphorate and acetate of potash and chloride of potassium:

C38H30CHO8 + 8(KO,HO) = C30H14K1O8 + 2C4H3KO4 + 4KC1 + 8HO.

Combinations It dissolves in 8 pts. of alcohol and in an equal quantity of ether. (Malaguti.)

Oxygen-nucleus C20H14O4.

Camphoric Anhydride.

 $C^{20}H^{14}O^{6} = C^{20}H^{14}O^{4}, O^{2}.$

Boullon-Lagrange. (1799.) Ann. Chim. 23, 153; Orell. Ann. 1799, 2, 221.

LAURENT. Ann. Chim. Phys. 63, 207; Ann. Pharm. 22, 41, and 135; abstr. J. Pharm. 23, 513.

MALAGUTI. Ann. Chim. Phys. 64, 152; J. pr. Chem. 11, 294; Ann. Pharm. 22, 41; J. Chim. méd. 13, 107.

Anhydrous Camphoric acid, Oxyde de Camphèse. (Laurent.)

Formation. By the action of heat on camphoric acid. (Bouillon, Laurent.) Also on ethyl-camphoric acid (Malaguti), methyl-camphoric acid (Loir. N. Ann. Chim. Phys. 37, 196), camphoranilic acid (Laurent & Gerhardt, N. Ann. Chim. Phys. 24, 191), camphorate of lead (Boucsein, N. Br. Arch. 83, 773), and by heating alkaline camphorates with an equal quantity of perchlorovinic ether. (Malaguti, Compt. rend. 41, 625; J. pr. Chem. 67, 277; Chem. Centr. 1855, 874.)—2. By the action of pentachloride of phosphorus on camphoric acid. (Gerhardt & Chiozza, Compt. rend. 36, 1050; Ann. Pharm. 87, 290; J. pr. Chem. 59, 452.)—3. By dissolving camphoric acid in oil of vitriol, and precipitating the solution with water. (Walter, N. Ann. Chim. Phys. 59, 177.)

Preparation. 1. Camphoric acid is distilled per se, and the white sublimate which settles on the neck of the retort is collected. (Bouillon, Lagrange.) — 2. Ethyl-camphoric acid is distilled; the solidifying distillate is dissolved in boiling alcohol; and the crystals of camphoric anhydride which separate after the cooling and further evaporation of the solution, are separated from the camphoric ether which remains dissolved in the mother-liquor, and purified by recrystallisation from alcohol.

(Malaguti.)

Properties. Long white prisms. (Malaguti.) — Crystallises from alcohol in long, upright, six-sided, very flat prisms, with rhombic base and broad faces on the two obtuse vertical lateral edges; the terminal faces are replaced by acumination-faces, two of which are rhombic and rest upon the acute vertical lateral edges, and two triangular, resting on the two vertical faces which replace the obtuse lateral edges of the prism. (Laurent.) Sp. gr. 1·194 at 20·5°; begins to sublime in long needles at 130°; melts at 217° (Malaguti); at about 220° (Boucsein); distils completely at 270°. — Tasteless at first, but after a while produces irritation in the throat. Neutral. Electric when rubbed. (Malaguti.)

	-1		1007	10000	000		(and the state of			
		110/2		9			Mala	guti.		
	20 C		120		65-93	3	66	24		
	14 H		14	****	7.65		7	.90		
	60		48	****	26.38	3	25	86		
1	C20H14	O ⁶	182		100.00	0	100	.00		
		Liebig.		Lau	rent.		Walter.		Boucsein.	
20 C		. 65.71		64	-87		65.55		65.70	
14 H		. 7.85		7	.87		7.91	*******	7.76	
60		. 26.44		27	.26		26.54	******	26.54	
C20H14	O6	. 100.00	******	100	00		100.00		100-00	

The colourless solution of camphoric anhydride in cold oil of vitriol gives off carbonic oxide when heated to 45°—50°, abundantly at 60°, and forms sulphocamphoric acid (xiii, 379, Walter, N. Ann. Chim. Phys. 9, 177). Camphoric anhydride dissolves in anhydrous or in fuming sulphuric acid, with evolution of sulphurous acid, forming a dark-coloured liquid. — Distilled with oil of vitriol and absolute alcohol, it yields ethylcamphoric acid. (Malaguti.)—2. When carefully distilled with anhydrous phosphoric acid, it gives off a gaseous mixture consisting of 1 vol. carbonic acid and 4 vols. carbonic oxide, yields a yellowish oil having a penetrating, but not disagreeable odour, and isomeric with oil of turpentine or with naphtha (88°30 p. c. C, 11°27 H), and leaves a black acid residue. (Walter, Ann. Chim. Phys. 75, 212.)—3. Alcoholic camphoric anhydride saturated at the boiling heat with ammonia-gas (or with ammonia or bicarbonate of ammonia, according to Malaguti), yields camphoramate of ammonia (Laurent, Compt. chim. 1845, 141; Ann. Pharm. 60, 326), and probably also camphoramide. (Laurent, Res. scient. 10, 123; J. pr. Chem. 27, 314.)—4. It is not acted upon by aniline in the cold, but when heated with it, yields camphoranile acid and camphoranil. (Laurent & Gerhardt, N. Ann. Chim. Phys. 24, 191.)

Combinations. Camphoric anhydride dissolves sparingly in cold water, somewhat more abundantly in boiling water (Malaguti), though with difficulty, and by prolonged boiling with water, is completely converted into camphoric acid. (Laurent, Boucsein.) According to Malaguti, the hot aqueous solution deposits unaltered camphoric anhydride, even after two hours' boiling.

Camphoric anhydride does not absorb ammonia in the cold. (Malaguti, Laurent, Compt. chim. 1845, 141.) — When ammonia-gas is passed over melting camphoric anhydride, a yellowish liquid distils over, which on cooling solidifies in a transparent mass, easily soluble in alcohol and water, and not giving off ammonia when boiled with aqueous potash.

Salts of Camphoric anhydride. Alcoholic camphoric anhydride does not precipitate metallic salts. (Boucsein.) — Camphoric anhydride appears to be capable of forming peculiar salts with bases (Laurent, Compt. chim. 1845, 141): it first unites with water, and then forms with bases, salts which have the same composition as the ordinary camphorates, but exhibit different properties. (Malaguti.) — Camphoric anhydride boiled with aqueous potash forms a camphorate of potash which crystallises, not in needles like the ordinary camphorate, but in broad pearly laminæ. (Malaguti.) — The solution produced by boiling camphoric anhydride for some time with milk of lime, deposits by evaporation, films, which require long boiling with water to dissolve them: alcohol added to the solution throws down small white needles containing 14 p. c. Ca, agreeing approximately with the formula C²⁰H²⁷Ca³O¹⁴ (calculation=13·67 p. c. Ca). Laurent (Compt. chim. 1845, 141; Ann. Pharm. 60, 330). — The aqueous solution of the potash-salt added to aqueous sulphate of copper, forms a precipitate containing 30·14 p. c. cupric oxide. — The aqueous solution of camphoric anhydride is not precipitated by neutral acetate of lead. (Malaguti.)

Camphoric anhydride dissolves in cold, and abundantly in hot alcohol (Malaguti), less easily than camphoric acid. (Laurent.)—It dissolves in

cold ether, more readily than in alcohol. (Malaguti.)

Oxygen-nucleus C20H12O6.

Cantharidin.

$C^{20}H^{12}O^8 = C^{20}H^{12}O^6, O^2$?

ROBIQUET. (1812.) Ann. Chim. 76, 302; Schw. 4, 198; J. Pharm. 14, 363; J. Pharm. 21, 123.

THIERRY. J. Pharm. 21, 44; Ann. Pharm. 15, 314; J. Chim. méd. 11,

139; J. pr. Chem. 8, 54.

REGNAULT. Ann. Chim. Phys. 68, 159; Ann. Pharm. 29, 314; J. pr.

Chem. 16, 316.

LAVINI & SOBRERO. N. J. Pharm. 7, 467; abstr. Repert. 100, 562.

W. PROCTER, Jun. Pharm. J. Trans. 12, 287; Viertelj. J. Pharm. 2, 322.

Vesicating principle of Cantharides, Canthariden-campher. Discovered by Robiquet in 1812.

Source. In Spanish flies or cantharides (Lytta vesicatoria, Fabric.); in Lytta vittata (Dana, Schw. 30, 247); Mylabris Cichorii (Bretonneau, J. Pharm. 14, 67); in Meloë violaceus, M. autumnalis, M. fucia, M. punctatus, M. variegatus, M. Scabrosus, M. majalis. (Lavini & Sobrero.)

Preparation. From Cantharides or Mylabris Cichorii, both of which contain about 0.4 p. c. of cantharidin (Warner, Viertelf. pr. Pharm. 6, 86), more easily from the latter, as they contain less oil. (Robiquet.) — 1. Aqueous extract of cantharides is evaporated to dryness; the residue is exhausted with hot strong alcohol; the solution evaporated to an extract; this extract is exhausted with warm ether; and the solution left to evaporate in the air. The residue is treated with cold alcohol to

Remotes a reliew suspenses and the resource emphasis is disRemotes. — Larm a remotes in , townsome mendered with water evaposition has been excellent the resource with water extent and leave
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is a few mendered at the case of the set of the set of the contract of the contra

Processes. The cross reconstraints for the feel prisms belonging to the right present a system. Which was belonging to the form of the present Figure . We will a of Fig. 55. — (i.e. = 107) 30; (i.g. — (i.e.) = 1.80) 55. The results are a minimalism from predict mance of the process for the process for

			Regnault.	Lavini & Sources
2		€1:12 .	60:36	61:17
. E	12	₹ 12	6.22	6:30
	₹4	32,66	33.42	32:53
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	: 35	Feet 60	100:00	100:09

Construct the C HO, but Gmelin placed it among compositioning 1. We have $\Sigma_{\rm c}=1_{\rm b}$ meric with pictotism.

Heated on platinum foil, it burns with a while it is a said of the said of the charge of the said of t

Combinations. Cantharidin is insoluble in water, whether cold or boiling. It is however rendered soluble in water by the yellow matter of cantharides, so that hot water extracts therefrom the whole of the cantharidin. (Robiquet and others.) — It dissolves without colour in hot oil of vitriol, and is precipitated by water. — It is nearly insoluble in cold hydrochloric acid of sp. gr. 1.18, and in cold phosphoric acid; a little more soluble in those acids when hot. - It dissolves abundantly in boiling nitric acid, scarcely at all in hot formic acid, slightly in cold, more easily in hot acetic acid of sp. gr. 1.041; 40 pts. of glacial acetic acid dissolve completely with the aid of heat, 1 pt. of cantharidin. According to Robiquet, it is insoluble in acetic acid. From all these liquids, the cantharidin crystallises on cooling. (Procter and others.)

It is insoluble in aqueous ammonia (Thierry), slightly soluble in the hot liquid (Procter). - It dissolves in potash and soda-ley, and is precipi-

tated therefrom by acetic acid. (Thierry.)

Slightly soluble in alcohol and acetate of ethyl when cold, more soluble when heated; less in wood-spirit, more in ether (in 34 pts. of cold ether, according to Warner); its best solvents are acctone and chloroform, which latter abstracts cantharadin from its aqueous solutions. — It dissolves in hot oil of turpentine, in the oils of cinnamon, cloves, and sassafras, also in almond-oil, olive-oil, and lard, and crystallises on cooling. (Thierry and others.)—According to Procter, Cantharadin is extracted from cantharides by glacial acetic acid, oil of turpentine, and olive-oil, but only the last-mentioned retains any considerable quantity of it in solution after cooling.

Appendix to Cantharidin.

Volatile Acrid Principles.

The irritating action of certain plants on the organs of sensation, is in all probability due to peculiar substances contained in them but not separable, and perhaps allied to the volatile oils or camphors. They were first distinguished as peculiar substances (Principia acra plantarum) existing in certain plants by Gren (Syst. Handb. d. Chem. 1794, 2, 229); they are very volatile, are lost in the drying of the plants, generally pass over in the distillate when the plants are distilled with water, and impart to the distillate their acrid burning taste; in some cases, however they are decomposed during distillation. They are often found in the alcoholic extract of plants, and are the cause of the exciting action of such extracts on the organs of sensation: they are especially distinguished by their easy destructibility. The most important of these volatile acrid principles are the following:

Volatile aerid principle in Aconitum Napellus. (Braconnot, Ann. Chim. Phys. 8, 139; Geiger, Mag. Pharm. 34, 62.) In the leaves before flowering, in the seeds after flowering; adheres to the chlorophyll in the leaves. It is not completely extracted by repeatedly pressing the plant with water, but alcohol extracts the whole of it. The fresh herb distilled with water in the chloride of calcium bath, diffuses a peculiar odour, irritating to the eyes, but not very acrid, and soon ceasing, and yields at first a distillate having a very acrid taste and odour, while the residue is quite destitute of acridity. The distillate loses by rectification more and more of its odour, which is destroyed at 100°,

Volatile acrid principle in Arum Dracunculus. (Landerer, Beret. 57, 199.) Occurs in the fresh roots, and in the inner blue part of the flower, but especially in the spadix. The fresh roots, which have a large, burning taste, lose it by boiling or roasting; the bruised spadies residen the skin when rubbed into it, but without raising blisters, and yield by distillation with water, an aqueous distillate, having a shap, the bine parts of the flowers yield, after digestion with alcohol, a very starp-tasting extract, the most volatile distillate of which produce residening and burning of the skin, while the less volatile residue or tains, in addition to wax and blue colouring matter, a sharp-tasting min soluble in other and in volatile oils.

Formula with the principle in Arum maculatum. (Stendel, Diss. intro. Polarite wird principle in Arum maculatum. (Stendel, Diss. intro. 2016). The property of and an emperoumatic odour; they yield non-acrid extracts with water, alcohol, acetic acid, and olive-oil, but nevertheless lose their acridity,

which is quite discreved by the action of those liquids.

Volatile novel principle in Clematis viticella. - The fresh plant yield he dissillation with water, a small quantity of yellow oil which floats on

the water, and has a barning taste.

Chematis flammula. (Braconnol, des Chematis flammula.)

The fresh plant yields an aqueous distillate, with all drops, which has a sharp caustic taste, reddens the skin, and from the minut be fixed oils, but is lost when the plant is boiled with water

The stems and leaves distilled in the first

same with a distillate having a very acrid taste and odour.

Takata aria principle in Dupline Metereum. (Landerer, Repert. St. 104.) The back piedes by distillation with water, a neutral liquid being a since lucrong taste, and, by exhaustion with alcohol, a day solution having a very serid taste, and yielding by evaporation a third carried from which ether removes all the actidity. The alcoholic excess, mined with neutral actiate of lead, filtered, and freed from excess of head by subdimented hydrogen, leaves by evaporation at burning uses, reddings the skin, dissolves in aqueous potash, and, who separated from the potneti-solution by distillation with phosphoric and a masspacent and contentiess, and has an acid, acrid, and pungent observed The walnut acris principle is not extracted from the bark by digestion with pure water, or with water containing bydrochloric acid.

Fidebile certail prescripts in Polyponeum Andropiper. (John, deer Silver S. 14.) The plant yields by distillation in non-latel ressels, a tassels water but it lated vessels, a water having a burning

the residue, in either case, is destitute of acridity.

Total arris principle in Demarches bulleans, R. Sammula, R. liegel. A nois (Braconnet, Ann. Chin. Phys. 5, 138.) The stalks and e especially the roots of these plants, weld by distillation with water if after two months, and deposits white flocks, together with small

shining micaceous scales, without losing its taste or odour. The residue of the distillation is free from acridity. - Ranunculus lanuginosus, R. auricomus, R. phyhonolis, R. repens, and R. ficaria, do not yield an acrid-tasting distillate by distillation with water. — The volatile acrid principle in Ranunculus sceleratus will be described with Anemonin C²⁰H¹²O¹².

The volatile acrid principle of certain Sponges (Letellier, Mag. Pharm. 16, 137,) is destroyed by distilling them with water, or by digesting them with vinegar, alcohol, or aqueous potash.

Picrotoxin.

$C^{20}H^{12}O^{8} = C^{20}H^{12}O^{6}, O^{2}$ }

BOULLAY. Fully, Bull. Pharm. 4, 5; Ann. Chim. 80, 209; Schw. 7, 365; further, J. Pharm. 5, 1; Taschenbuch, 1820, 122; Repert. 7, 76; abstr. Gilb. 63, 319; further, J. Pharm. 11, 505; abstr. Repert. 23, 166; Kastn. Arch. 7, 374; further, J. Pharm. 12, 106.

MERCK. N. Tr. 20, 1, 134. DUFLOS, Schw. 64, 222.

Pelletier & Couerbe. Ann. Chim. Phys. 54, 181; Ann. Pharm. 10. 183.

Menispermin (but different from the menispermin of Pelletier). Picrotoxic acid. - Discovered by Boullay in the seeds of Memspermum Cocculus.

Preparation. 1. The seeds separated from their husks are boiled with water; the decoction is evaporated; the residue exhausted with boiling alcohol of 38° B; the filtrate left to itself in a cool place for several days, any fat that separates being removed, and then evaporated to dryness; the residue comminuted with a small quantity of water and to of its weight of magnesia, which forms insoluble compounds with any acid that may be present and with the fat; the mixture completely dried, and repeatedly boiled with alcohol of 30°; and the solution evaporated to the crystallising point, after decolorisation with animal charcoal. (Boullay.) The picrotoxin thus obtained may be purified by solution in boiling alcohol of 20° B. and spontaneous evaporation. (Boullay.)

The aqueous decoction merely freed from fat deposits, by evaporation, nodules, which, when treated, first with cold and then with hot water, leave colourless picrotoxin, to be purified by recrystallisation. (Meissner, Berl. Jahrb. 1827, 1, 132.) — Casaseca (J. Pharm. 12, 99; abstr. Kastn. Arch. 7, 376) likewise exhausts the watery extract with alcohol; evaporates; removes the fat; sets aside the remaining extract in contact with magnesia; and boils it for 24 hours with absolute alcohol, whereupon picrotoxin crystallises from the filtrate on evaporation. - If the aqueous decoction evaporated to a thick syrup be set aside for 24 hours with $\frac{1}{20}$ of baryta or magnesia, then repeatedly boiled with absolute alcohol, the tincture evaporated to dryness, and the residue again treated with alcohol,-the alcoholic solution, after being decolorised by animal charcoal, yields crystals of picrotoxin by evaporation and cooling. (Boullay.)

2. The decoction is precipitated with subacetate of lead; the dissolved lead removed from the filtrate by sulphuretted hydrogen; the residue exhausted with alcohol; the solution filtered and evaporated; the residue again exhapsive with alcohol; and the solution in alcohol. I sering the every out of the repeated till the extract becomes completely so the fitting to the life which are solution evaporated to a symple then n and with currentate of petash, which, by removing the acetic soll separates the permitties after a while in the crystalline form; an additional separates the permitted after a while in the crystalline form; an additional separates the permitted acetic soll. The country of theretain is obtained by evaporation from the notice that which Liewise contains sugar and colouring matter; and the entire product is washed with cold water and crystallised from water

The second state of pictotaxin are likevised to the second state of pictotaxin are likevised to the second state of pictotaxin are likevised to the second state of th the vegitierie grates the fat eremove infter cooling; the residue bolel with the weight of water the solution filtered at the boiling heat that is a same after solution of a small quantity of acid, according to Theorem and the control of the c 20 1 2 The period of the extract its fulle in water contains menispernia, pur-nessed in their convention of the extract. W. Pelletier & Couerbe.) The extract if side of the in- of operales prepared with weak alcohol yields by a report of the property o

Halo a state take the attents decorrion of cocculus grains nearly the present of a term of the removes the separated oil; evaporate the passetth fit tay books, removes the separated oil; evaporate to an extract heats the extract in a distillatory apparatus with alcohol of some the fit sinchibility rassed over; pours off the solution; the fit sinchibility rassed over; pours off the solution; the consistence of the alcohol, and shaken up with the solution, together with the solution of the solution, together with the solution of the solution of the consistence of the solution of the soluti

The second of the second of the shelled grade in the second of the secon es e pe es s'apet tixo te igstellat.

With sixting fire-sided prisms. (Boullay.) Sore property and the less sometimes flexible silky threads, and transport there's that mis tail to dillat at I hard granular masses, varying t and the presence of the emerical in and temperature of the solution and the presence of the solution. (Pelietter & Couerbe.) Without men vegeta to the Couermann, Dutles.) According to the continuous of solution in a solution of the soluti

Ms. act . 2. Fee gree's killed young dogs, with convulsions and veter Does not contain any water of crystallisation. (Pelleter nete. The alcoholic solution turns the plane of polarisation

to the left, Leevo-rotatory power = 28·1 (Bouchardat & Boudet, N. J. Pharm. 23, 288, J. pr. Chem. 60, 118. Liebig u. Kopp's Jahresber. 1853, 194).

	a.			rmann.
20 C	12	6.12	24 C	5.86
C20H12O8	196	100.00	C24H14O10 238 100·00 10	0.00

	elletier & Couerbe.		egnault.		Francis.	
	mean.		mean.		mean.	
C	59.77		59.52		60.26	
Н	6.00	*******	5.86	*******	5.70	
0	34.23		31.62		32.74	
			Ver. 22		28.22	

100.00 100.00 98.70

Isomeric with cantharidin.—According to Oppermann (Mag. Pharm. 35, 237; Pogg. 23, 446), it is C⁹H³O² = \(C^{24}H^{12}O^{8}; according to Pelletier & Couerbe, C¹²H⁷O⁵. Gerhardt (Traité 4, 227) adopts the first formula doubled = C¹⁰H³O⁴.—It is perfectly free from nitrogen. (Oppermann, Erdmann & Marchand, J. pr. Chem. 37, 146, and others.) According to Francis (Lieb. Organ. Chem. 335), it contains 0.75—1.30 p. c. nitrogen.

Decompositions. 1. By dry distillation, it yields carbonic acid and combustible gas, a small quantity of acid water, a very large quantity of acid brownish yellow, empyreumatic oil, but no ammonia, and leaves charcoal. brownish yellow, empyreumatic oil, but no ammonia, and leaves charcoal. (Boullay.) When heated, it melts like wax, takes fire and leaves charcoal. (Merek.) Melts to a brown liquid and gives off aromatic acid vapours. (Gmelin.) Decomposes when heated on red-hot coals, without melting or taking fire. (Boullay.) — 2. It is not altered by boiling with iodine and water, and crystallizes by evaporation, free from iodine and hydriodic acid. (Pelletier & Couerbe.) Triturated with $\frac{1}{10}$ part of iodine, it forms a redbrown mass which yields a reddish solution on addition of water. (Vogel, Br. Arch, 16, 155.) It is not altered by sulphurous acid, or chlorine (Boullay), or by iodic acid (Duflos), and is not coloured by vapour of bromine, iodine; or chloride of iodine. (Doune.) — 3. Cold oil of vitriol dissolves it with yellow colour (without colouring, according to Merck); warned oil of vitriol chars it. (Boullay.) — 4. It dissolves without warmed oil of vitriol chars it. (Boullay.) - 4. It dissolves without decomposition in cold nitric acid, forming a greenish yellow solution (the colour of which gradually disappears, according to Duflos); but warm nitric acid converts it into oxalic acid. (Boullay.) With aqua regia it likewise yields oxalic acid. (Pelletier & Couerbe.) It is reddened by nitric acid (Pettenkofer, Repert., 7, 91); not coloured (Merck). - 5. It does not give off ammonia when treated with hydrate of potash. (Boullay.) By strong ammonia, potash, or soda, it is completely decomposed, especially if gently heated, and from the resulting orange-coloured solution, acids throw down a brown powder similar to that which is produced from many organic bodies by the action of potash. (Pelletier & Couerbe ; see also Combinations:) - Aqueous picrotoxin changes the colour of bichromate of potash to a fine green. (Duflos.) In alkaline solution, it reduces protoxide of copper to di-oxide. (G. Beckers, N. Br. Arch, 85, 22; G. Günkel.) Hence Ludwig (N. Br. Arch, 82, 139), who examined it only after boiling with acids, was led to regard it as a conjugated sugarcompound. — Solutions of gold, silver, and copper-salts are not altered by aqueous picrotoxin for several hours, provided light be excluded: ferre sulphate is very slowly reduced to ferrous sulphate. (Duflos.)

Combinations. It dissolves in 150 pints of water at 14, in 25 pts. of boiling water (Pelletier & Conerbe, Boullay), in 180 pts. of boiling water (Merck), in 162 pts. of cold, 54 pts. of boiling water (Dufles), in 160 pts. of water at 183 Abl. (Oesterreich. Zeitschr. Pharm. 8, 201).

With Acids. - According to Boullay, pierotoxin unites with acids to form salts, which, however, is denied by Oppermann and others. — It does not neutralise the smallest quantity of acid. (Oppermann.) Even a very large excess of picrotoxin does not remove the acid reaction from water containing traces of hydrochloric acid. It crystallises free from hydrochloric acid from a solution containing that acid. (Pelletier & Couerbe; Regnault, Ann. Pharm. 29, 214; J. pr. Chem. 16, 289; Dufos, Similarly with iodic acid. (Serullas.) Hence the picrotoxin-salts, described by Boullay, are probably merely picrotoxin with adhering acid.

— Picrotoxin dissolves in dilute acids (Boullay); not more than in pure water, more abundantly only in acetic acid. (Pelletier & Couerbe)

With Alkalis. — Aqueous ammonia, potash, and soda dissolve pier-toxin very abundantly. (Boullay.) Acids, even carbonic acid, separate it unaltered from the solution. (Pelletier & Couerbe.) Hence it is regarded by Pelletier & Couerbe (not by Liebig, Ann. Pharm. 10, 204) as an acid: picrotoxic acid. If the alkali is saturated, while hot, will picrotoxin, that substance separates on cooling, and, after washing will cold water, is free from alkali. When a solution of picrotoxin in potal is placed in the voltaic circle, picrotoxin is deposited in slender needles at the positive pole, while the liquid at the negative pole becomes richer in potash and is no longer bitter. (Pelletier & Couerbe.) — Baryta, strents, lime, and magnesia, prevent the crystallisation of picrotoxin in needless. Lime causes it to crystallise in plates or granules, and needles are preduced on addition of acids.

Picrotoxin with Oxide of Lead. - Oxide of lead forms, with picrotexin, a very soluble uncrystallisable salt, which may be obtained by prolocate boiling of picrotoxin with excess of oxide of lead and a small quantity of water, and evaporating the filtrate in vacuo. Contains 45 or 48 p.c. oxide of lead. (Pelletier & Couerbe.)

With Organic bodies. - It dissolves in 3 pts. of hot alcohol of sp. gr. 0.81. The solution on cooling solidifies in a silky mass. It is precipitated by a small quantity of water. The finest crystals are obtained from a

mixture of equal parts of alcohol and water. (Boullay.)

It dissolves with difficulty in cold ether (Merck), in 250 pts. of ether of sp. gr. 0.7. (Boullay.) Picrotoxin is not extracted from its accessolution by ether, or from the alcoholic solution mixed with eastern potash, but ether abstracts it from the alcoholic solution mixed with

hydrochloric acid. (G. Günkel, N. Br. Arch. 94, 14.)
Picrotoxin dissolves completely in concentrated acetic acid, but requires 2400 pts. of distilled vinegar to dissolve it, and does not dissolve perceptibly in a mixture of equal parts of distilled vinegar and water. (Merck.) Acetic acid facilitates the solution of picrotoxin in water. (Pelletier & Couerbe.) The easily produced solution of picrotoxin is acetic acid, which is precipitated by concentrated carbonate of potatic. rields by evaporation, according to Boullay, needles of acctate of pierotoxin, which give off acetic acid when treated with nitric acid, but not with sulphuric acid, and when washed with water, lose their acid reaction, but not the whole of the acetic acid.

Aqueous picrotoxin is not precipitated by tincture of galls. (Duflos.) Picrotoxin (containing acid) does not dissolve in oils, either fixed or

volatile. (Boullay.)
Other Compounds. Picrotoxin forms with quinine, cinchonine, morphine, strychnine, and brucine, compounds, which are more soluble than these bodies in the separate state; they are crystallisable, and are decomposed in the voltaic circuit, the picrotoxin going to the positive, and the alkaloid to the negative pole. (Pelletier & Couerbe.)

Appendix to Picrotoxin.

Brown Acid from the Husks of Cocculus-grains.

PELLETIER & COUERBE. Ann. Chim. Phys. 54, 196; Ann. Pharm. 10. 195.

Acide hypopicrotoxique.

Preparation. The coarsely pulverised husks of cocculus-grains are exhausted in a Papin's digester with alcohol; the wax which separates as the tincture cools is removed by filtration; the solution is evaporated; and the residual extract is exhausted, first with cold water, then with boiling acidulated water, and finally with ether, which when evaporated leaves a brown extract, a mixture of the chlorophyll and the brown acid. The part of the extract which is insoluble in ether, dissolves in boiling alcohol (or in aqueous potash), forming a solution which deposits wax on cooling, and the filtrate separated therefrom leaves on evaporation a brown mass, from which ether extracts fat and chlorophyll, leaving the brown acid.

Properties. Solid, amorphous brown mass, which softens at 100°.

				Pelle	tier & Couerbe.
22 C 13 H 8 O	13	****	6.2		64·14 6·09
C22H15O8	209	****	100.0		100.00

So according to Pelletier and Couerbe. - The analysis gives 1/2 p. c. too much carbon, the contrary of that which generally takes place; and as the capacity of saturation was not determined, the formula is altogether inadmissible. Liebig, Ann. Pharm. 10, 297.—It is perhaps picrotoxin, contaminated with the brown acid into which that substance is converted by alkalis. (Gm.)

It is insoluble in water, even at the boiling heat.

It dissolves readily in alkalis, forming a dark-coloured solution, whence it is precipitated by acids in brown flocks. Insoluble in ether.

Oxygen-nucleus CoH1000.

Oenolin.

 $C^{20}H^{10}O^{10} = C^{20}H^{10}O^{6}, O^{2}.$

Mulder. Chemie des Weins. Leipzig, 1856, S. 44, u. 228. Glenaud. Compt. rend. 47, 468; J. pr. Chem. 75, 316; fully, N. Am. Chim. Phys. 54, 366.

Ocnotic scid. The colouring matter of the skins of red grapes and d red wine. — A. Vogel (Schw. 20, 417) and Ficinus (Br. Arch. 2, 200) were acquainted with the behaviour of red wine to acids, alkalis and lead-salts. — Batilliat's Rosite is, according to Mulder, a mixture extaining oenolin (vide inf.) Fauré (Analyse chimique et comparée des nui de la Gironde, 1844; abstr. Mulder's Chemie des Weins, 245,) distinguishe a blue and a yellow colouring matter of wine, both of which, according to Mulder, were impure or products of decomposition.

Preparation. A. From Grape-skins. The skins, after being we washed with water, are exhausted with water containing acetic acel; the solution is precipitated by neutral acetate of lead; and the washed precipitate is suspended in water and decomposed by sulpharatelydrogen. The sulphide of lead, purified by boiling with water, give up the colouring matter to acetic acid, and the solution when avaporate leaves the colouring matter, which may be purified from adhering fathy with other. (Mulder.)

From Red Wine. 1. Bordeaux wine is precipitated with method of lead; the dirty blue precipitate is collected and washed, as large the water runs off coloured, then decomposed under water by sulphantial holders: it the precipitated sulphide of lead is freed from apothem by the water; and the colouring matter is extracted from it by almost actic acid. The solution when evaporated leaves the colouring matter, which may be freed from fat by ether, and from adhering leaves by acetic acid. (Mulder.)—2. Red wine is precipitated by but acotate of lead; and the blue precipitate is washed by decantation, then on the filter, afterwards dried between 100° and 110°, and treated in the date of fine powder in the displacement apparatus, with such a quantity of any drous ether into which hydrochloric acid gas has been previously passed that the hydrochloric acid contained in it may not completely attend the lead-oxide in the precipitate. After the ether containing hydrochloric acid has run off, the precipitate is washed with pure other as long as anything is taken up,—tartaric acid, tannic acid, a peculiar crystallisable and volatile acid, fat and wax being thereby removed; and the washed precipitate is dried by exposure to the air, and exhausts with other, as long as colouring matter continues to dissolve. The almost tincture freed from the greater part of the alcohol by distillation and mixed when cold with 4 or 5 vols, water, deposits red flocks with the completely washed with water and dried. (Glenard.)

violet-red colour, or red-brown if the mass has been dried between and 120°. (Glénard.) Bluish black mass, resembling plantage.

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(Mulder.) In the moist state it has the dark colour of wine-lees, without lustre. Under the microscope, it appears to be composed of roundish groups of granules. Permanent in the air. (Glénard.)

At	1209				Glénard.
20 C	0.00	~	57-14		
0 H	10	****	4.76		4.89
00	80		38.10		38.09
C20H10O10	210		100:00	17.3	100:00

Decompositions. 1. Swells up when heated, giving off a peculiar odour and leaving charcoal. (Glénard.)—2. Burns on platinum-foil. (Glénard.)—3. When its solution in weak alcohol is boiled for a long time with water, it becomes insoluble in alcohol, and iridescent films form on the surface of the water. (Glénard.)—4. The alcoholic solution of oenolin is decomposed by hot, but not by cold oil of vitriol. (Glénard, vid. inf.)—5. A small quantity of weak nitric acid imparts a brighter colour to the alcoholic solution of oenolin; but a larger quantity gradually decolorises it, more quickly if heated (Mulder), with formation of a brown detonating resin.—6. Oenolin dissolved in alcohol is converted by chlorine into a yellow soluble compound (Glénard); when dissolved in a mixture of alcohol and tartaric acid, it is first coloured brown by chlorine, and yellow by a larger quantity. (Mulder.)—With chloride of lime, a yellow-brown precipitate is formed, together with a yellow solution. (Glénard.)—7. In contact with potash-ley or carbonate of soda, it absorbs oxygen, and turns brown. (Glénard.)—Its solution in alcoholic tartaric acid acquires the colour of chrome-alum on addition of a small quantity of ammonia; a somewhat larger quantity colours it blue; an excess, green, and after a few seconds brown. The green, but not the brown solution, is coloured red by acids. Potash, soda and lime act like ammonia.

Oenolin is insoluble in water (Mulder), very sparingly soluble in cold

water, somewhat more in hot. (Glénard.)

Oil of vitriol colours the solution of oenolin in alcoholic tartaric acid bright light red, and in excess, violet, the pure red colour being however restored by addition of water. (Mulder.) — Hydrochloric acid does not alter the weak alcoholic solution, even at the boiling heat.

Oenolin dissolves more readily in water containing tartaric or acetic acid. It dissolves in wood-spirit, not in sulphide of carbon or chloroform.

(Glénard.)

According to Mulder, oenolin is quite insoluble in alcohol; according to Glénard, it dissolves readily, with fine crimson colour, and remains as a varnish when the alcohol evaporates. — According to Mulder, it dissolves in alcohol containing a trace of acetic acid, with pure blue colour, and if more acetic acid is present, with red colour. (Mulder.) In alcohol containing tartaric acid, it dissolves slowly but completely, with pure red colour. (Mulder.)

The alcoholic solution exhibits the following reactions: Bicarbonate of soda colours it blue; chloride of calcium forms a blue precipitate; alum brightens its colour, and on addition of carbonate of soda, forms a lilac lake. — With neutral acetate of lead, it yields a pure blue precipitate, which, after drying at 120°, contains 35.67 PbO, and after subtraction thereof, contains in 100 pts. 59.67 p. c. C. 4.49 H, and 35.84 O, and is therefore C²⁰H⁰PbO¹⁰ (calculation 35.74 PbO, and 59.71 C, 4.47 H,

Life I. With nature of level in forms after a few seconds a violet premionate and with the loss of accuse, blue inclining to brown. It was a violet while and then forms a bluish violet precipitate. In them, thus forms a bluish violet precipitate. In them, thus forms a bluish violet precipitate. In them, thus forms a bluish violet precipitate. Tall violet of the second characteristic was proportionally of the violet-rad. north and a first of the state of wine-less mercuno nitrate light-brown, editor For the state which It does not precipitate mercure to the Beauti

The sound of shared Trees and the state of sound and a small quantity of metric and a small quantity with nature and based about a precipitate being satisfies with red colours or alcoholic acetic acid. It is coloured darker red to what the best order of the natural of the natural and a state of after a small process of the second of th mounted united red by mercane official, darker red by nitrate of eller Maries

denote is institute in over, learner threshil, and oil of turpentise

the state of the s print the salved the solution of gelatin; and

ins i trace emporator

Louis reserved. When leaved it leaves slowly burning charcol

end a substitute of cleak nearly leading sition in all of elected of 60 s and a result of a result of all of the following sitions in the state of a result of a r

From First of one in the solin, at of old wines, with tiple of session statistic for Turk blockshiped. Has a roof astroper that I lead is when turns at ast consisting of line, passed in the Institute A to The Passaves in the front interior, and it present the lity water — S. The in the yest of closed of 80 p. c. less states to savinger about and quite institute in other. With page forms a comparation inscitible in water and in alcohol. firms a compound markible in water and in alcohol.

Chierren des CCPP.

Quintichloromenthene.

CFC::HF.

De mam em Ling i Boome Rose Lairent, Ren, scient, 14, 341 o Con-

Dry elliptor spassed to mentione p 445; as long as hydrell of an improved to the action of elliptors with visit and the conformal field was placed to the action of elliptowas of as a long at life is verient nie of calcium, then in vacco. Yellow syrony liquid leavier than water.

					Walter.
20 C	120.0	••••	38.64	•••••	38.24
13 H	13.0	••••	4.18		4.68
5 Cl	177.5	••••	57:18		57.30
C20Cl5H13	310.5		100.00		100.22

Burns, when set on fire, with a smoky, green-edged flame. Oil of vitriol colours it deep red.

Soluble in cold alcohol and wood-spirit, more readily in ether and in oil of turpentine. (Walter.)

Oxyamidogen-nucleus C30AdH15O4

Camphoramic Acid.

 $C^{20}NH^{17}O^6 = C^{20}AdH^{15}O^2,O^4.$

LAURENT. (1845.) Compt. chim. 1845, 141; abstr. J. pr. Chem. 35, 501; Ann. Pharm. 60, 326; Repert. 100, 89.

Camphoraminsaure, Camphoramsaure, Acide camphoramique.— The crystals which form on saturating camphoric anhydride with ammonia were regarded by Malaguti (Ann Chim. Phys. 64, 162) as a peculiar camphorate of ammonia: their true nature was recognised by Laurent.

Formation and Preparation (p. 468). A boiling solution of camphoric anhydride in absolute alcohol, concentrated as much as possible, is saturated with ammonia-gas; the crystals of camphoramate of ammonia which separate on cooling (and of which the mother-liquor yields a larger quantity by gentle evaporation), are dissolved in a larger quantity of water and decomposed by hydrochloric acid; and the acid which separates by cooling or by evaporation at a gentle heat, is purified by recrystallisation from cold alcohol.—When hot concentrated solutions of camphoramate of ammonia are decomposed by hydrochloric acid, the camphoramic acid separates as a syrup, a small quantity only remaining dissolved in the supernatant liquid. (Malaguti, Laurent.)

example rainate of ammonia are decomposed by hydrochloric acid, the cample rainate acid separates as a syrup, a small quantity only remaining dissolved in the supernatant liquid. (Malaguti, Laurent.)

Properties. Colourless, transparent, rectangular prisms. Fig. 56 with p-face. u:u behind = 114° 30′; $u:t=122^{\circ}$ 45′; $a:u=155^{\circ}$; $i:t=138^{\circ}$ 20′.— Melts when heated and solidifies on cooling, partly crystalline, partly as a transparent vitreous mass, which is no longer camphoramic acid.

					Laurent.
20 C N					
17 H	17	••••	8.50	*******	8.4
6 O	48	••••	24.17	••••••	24.5
C20AdH15O6	199	••••	100.00		100.0

By heating to 150° — 160°, or by distillation, camphoramic acid is converted, with loss of water, into camphorimide.

The acid dissolves sparingly in water. — With bases, it forms the Camphoramates, which are crystallisable and all soluble in water. — YOL, XIV. 2 I

Aqueous camphoramate of ammonia does not precipitate lead, silver, or

copper salts.

Camphoramate of Ammonia. Prepared as above, or by dissolving camphoramic acid in alcoholic ammonia, and purified by recrystallisation, washing with absolute alcohol, and drying at a moderate heat. — Slightly acid, bitter crystals, from the solution of which, chloride of platinum precipitates half the nitrogen as chloroplatinate of ammonium. — The salt melts at 100°, and, between 150° and 160°, gives off ammonia and 21°6 p. c. water, and is converted into camphorimide which solidifies in a vitreous mass; likewise by distillation.

						Mala	guti.	Lau	rent.
20	C	***************************************	120	****	51.2	*******	50.1	****	51-1
2	N	***************************************	28	****	11.9	********	12.1	****	11.7
22	H	***************************************	22	****	9.4		9.1		5.3
8	0	***************************************	64	****	27.5	*******	28.7		27-9
Ca	Ac	iH14O5,NH4O + 2Aq	234	***	100.0	,,,,,,,,	100.0	****	100.0

Malaguti regarded the salt which he examined, as a peculiar camphorate of ammonia (comp. p. 468).

Camphoramate of Lead. — The concentrated boiling solution of camphoramate of ammonia in alcohol, mixed with less than the equivalent quantity of alcoholic neutral acetate of lead, deposits on cooling small needles, which, when washed with a little alcohol and dried at a gentle heat, contain 33 p. c. of lead, and are therefore C²⁰AdPhH¹¹O⁶ (calculation = 34.5 p. c. Pb). Dissolves with moderate facility in alcohol. Camphoramate of Silver. — The concentrated alcoholic solution of

Camphoramate of Silver. — The concentrated alcoholic solution of camphoramate of ammonia, mixed while hot with alcoholic nitrate of silver, solidifies on cooling to a jelly containing crystals. These are washed with absolute alcohol and pressed between paper. — Very slender, long, microscopic needles, containing 34.7 p. c. silver (C²⁰AdH¹⁰AzO² = 35.1 p. c. Ag.).

Camphoramic acid dissolves in alcohol more readily than in water

(Laurent.)

Oxyamidogen-nucleus C20Ad3H14O2

Camphoramide.

 $C^{20}N^2H^{18}O^4 = C^{20}Ad^2H^{14}O^2,O^2.$

LAURENT. Rev. scient. 10, 123; J. pr. Chem. 27, 314; Repert. 80, 114.

Oxyde d'amed camphèse (Laurent, Rev. scient. 14, 506).

When ammonia-gas is passed through the solution of camphoric anhydride in absolute alcohol, and the saturated solution is evaporated, there remains a thick syrup, which is not decomposed by cold bydrechloric acid,—gives off ammonia when treated with hydrate of potash, and forms camphorate of potash,—is insoluble in water, but soluble in alcohol. This is probably camphoramide.

Conjugated Amides of Camphoric Acid.

Camphoranilic Acid.

 $C^{20}NH^{21}O^6 = C^{20}(C^{12}NH^6)H^{15}O^2, O^4.$

LAURENT & GERHARDT. (1848.) N. Ann. Chim. Phys. 24, 191; Ann. Pharm. 68, 36; abstr. Pharm. Centr. 1849, 74.

Phenyl-camphoramic acid.

Formation. By heating camphoric anhydride with aniline, cam-

phoranil being formed at the same time.

Preparation. Camphoric anhydride is heated with aniline, and after the vitreously solidified mass has cooled, the camphoranilic acid is dissolved out of it by hot aqueous ammonia, camphoranil then remaining undissolved. The solution is precipitated by nitric acid, and the precipitated flocks are washed.

Properties. Flocks which melt in boiling water to a resin, becoming crystalline by continued boiling with water. From dilute, lukewarm, weakly alcoholic solutions, it may be obtained in needles, but from con-

centrated strongly alcoholic solutions it separates as a resin:

							erhardt
82 C	. 192		69.82		68· 6	••••	69.5
N	. 14	••••	5.09	•••••			
21 H	. 21	••••	7.64	• • • • • • • • • • • • • • • • • • • •	7.7	****	7.6
6 O	. 48	••••	17.45	•••••			

Decompositions. 1. By distillation, it is completely resolved into aniline and camphoric anhydride.—2. When slightly heated with oil of vitriol, it gives off carbonic oxide.—3. Fused with hydrate of potash, it gives off aniline.

It dissolves sparingly in boiling water, and solidifies in the crystalline form on cooling.

With bases, it forms the camphoranilates. The ammonia-salt does

not precipitate the salts of lime or baryta.

Camphoranilate of Ammonia. — The solution of camphoranilic acid in alcoholic ammonia leaves when evaporated, a syrup from which water separates a portion of the camphoranilic acid. It may be obtained, like the acid, as a resin or in crystals, corresponding to the different states of camphoranilic acid.

Camphoranilate of Silver. — Obtained by mixing the ammonia-salt with nitrate of silver, as a white precipitate, which contains 28.25 p. c. silver, and is therefore C³²NA²⁰AgO⁶ (calculation = 82.27 p. c. Ag), slightly soluble in water.

Camphoranilic acid dissolves very easily in alcohol and in ether. (Laurent & Gerhardt.)

Camphoranil.

$C^{32}H^{19}NO^4 = C^{20}(C^{12}NH^6)H^{13}O^4$?

LAURENT & GERHARDT. (1848.) N. Ann. Chim. Phys. 24, 191; Ann. Pharm. 68, 35; abstr. Pharm. Centralbl. 1849, 73.

Phenylcamphorimide.

Comp. p. 468. Camphoric anhydride is heated with aniline; the vitreous mass which forms on cooling is treated with hot dilute aqueous ammonia to extract camphoranilic acid; the residue is dissolved in alcohol or in ether; and the solution is left to evaporate:

$$C^{20}H^{14}O^6 + C^{12}H^7N = C^{32}H^{19}O^4 + 2HO$$

Properties. Shining needles, which sublime without decomposition, melt at 116°, and solidify to a somewhat crystalline mass on cooling:

						Laurent Gerhardt.
32 C		192		74.70		74-3
N	******************	14	****	5.44	*******	
19 H		19		7.39		7-4
40		32	****	12.47		
C32H19	NO4	257	-	100:00		-

Decompositions. 1. Camphoranil is not decomposed by aqueous potash, but with hydrate of potash in the state of fusion, it gives off aniline.—
2. It dissolves slowly concentrated aqueous ammonia containing a little alcohol, whereupon camphoranilate of ammonia crystallises on cooling.

Combinations. Insoluble in cold, but somewhat soluble in boiling are true.

water. — Part melts in boiling water, while the rest dissolves and crystal-lises as the liquid cools. — The solution of camphoravil in very weak aqueous ammonia containing alcohol, forms with nitrate of silver a white crystalline precipitate, probably C³²H¹⁸AgNO⁴.

Camphoranil dissolves readily in alcohol and ether, and crystallises on cooling from very weak alcohol, in long shining needles. (Laurent 4

Gerhardt.)

Oxyazo-nucleus Con H15O2.

Camphorimide.

 $C^{20}NH^{15}O^4 = C^{20}NH^{15}O^2, O^2$

LAURENT. (1845.) Compt. chim. 1845, 147; abstr. J. pr. Chem. 35, 503; Ann. Pharm. 60, 326; Repert. 100, 89.

Bicamphorimide. (Löwig.)

Formation and Preparation. Camphoramic acid or its ammonia-salt is heated to 150°-160° (whereupon water and ammonia are given off) or distilled, and the colourless mass, which solidifies in the vitreous form on cooling, is crystallised from alcohol.

Properties. Colourless six-sided tables. Melts when heated; solidifies in the vitreous form on cooling; volatilises without decomposition at a stronger heat; and sublimes partially in white fern-like laminæ, apparently terminated with faces of a rhombic dodecahedron :

15 H 15	7.7	
4 0 32	 17.7	 N.544

Camphorate of ammonia — 2 At. HO and 1 At. NH3, or bicamphoramate of ammonia. — 2 At. HO, or camphoramic acid — 2 At. HO. (Laurent.)

Decompositions. Hydrate of potash boiled with alcoholic camphorimide eliminates ammonia.

Combinations. Camphorimide dissolves in gently heated oil of vitriol. Water added to the solution throws down white microscopic crystals, consisting of acute six-sided pyramids.

It dissolves readily in boiling alcohol. — The solution in weak alcohol solidifies after evaporation to a transparent gum, which solidifies in

24 hours to opaque nodules. (Laurent.)

Primary Nucleus C20H20.

Capric Acid.

 $C^{20}H^{20}O^4 = C^{20}H^{20}, O^4.$

Ann. Chim. Phys. 23, 22; Schw. 32, 179; CHEVREUL. (1818.) Recherches sur les corps gras. 143.

LERCH. Ann. Pharm. 49, 223.

ILJENKO & LASKOWSKY. Ann. Pharm. 55, 78.

GOTTLIEB. Ann. Pharm. 57, 64.

CAHOURS. Thèse presenté à la faculté des sciences à Paris, le 15 Janvier,

1845, 132; Compt. rend. 26, 263.

Gerhardt. N. Ann. Chim. Phys. 24, 96; J. pr. Chem. 45, 327.

Görgey. Ann. Pharm. 66, 290; Pharm. Centralbl. 1849, 8; N. Ann. Chim. Phys. 25, 102.

ROWNEY. Ann. Pharm. 79, 236; J. pr. Chem. 54, 211; Quart. J. Chem. Soc. 4, 332; Chem. Gaz. 1852, 32.

REDTENBACHER. Ann. Pharm. 57, 150; 59, 54.

Fehling. Dingler. pol. Journ. 130, 77; N. J. Pharm. 25, 94.

Acide caprique. (Chevreul.) Acide rutique. (Cahours.) Discovered by Chevreul in 1828, but according to Lerch, not obtained by him in the pure state.

Sources. In the butter of cow's milk (Chevreul); in Limburg cheese (Iljenko & Laskowsky); in cocoa-nut oil (Görgey); in train-oil (Wagner, J. pr. Chem. 46, 115); in Scotch fusel-oil (Rowney); in the perspiration of the human foot (Brendecke, N. Br. Arch. 70, 26 and 34); in fusel-oil from maize and rye (Wetherill, Chem. Gaz. 1853, 218; J. pr. Chem. 60, 202); in the so-called oil of grapes from Leipzig (Fehling); in the

molasses of mangold-wurzel (Fehling); in potato fusel-oil (S. W. Johnson, J. pr. Chem. 62, 262). According to Wagner, it may be recognised, since it is always accompanied by capric aldehyde, by heating the body under examination with oil of vitriol, and adding hydrate of potash in excess, whereupon the odour of oil of rue becomes perceptible. (J. pr. Chem. 45, 155.)

Formation. In the dry distillation of oleic acid or of fats containing olein. (Gottlieb.) In the oxidation of the following substances by nitric acid: oil of rue (Cahours, Gerhardt); oleic acid and choloïdic acid (Demarçays, Redtenbacher). — In the putrefaction of casein and fibrin. (Brendecke.) — Generally, it is formed simultaneously with the other volatile fatty acids.

Preparation. A. From Butter of Cow's milk. (Comp. x, 80.)—
1. When the mixture of caprylate and caprate of baryta obtained in the preparation of butyrate of baryta, is completely dissolved in boiling water, the filtrate, on cooling becomes filled with thin scales of caprate of baryta having a fatty lustre, and the mother-liquor filtered therefrom and evaporated down to \(\frac{3}{4}\), yields an additional quantity (Lerch).

from and evaporated down to \$\frac{3}{4}\$, yields an additional quantity (Lerch).

From the baryta-salt thus obtained and purified by recrystallisation, the acid may be obtained in two ways. — 1. To 10 pts. of the baryta-salt is added a solution of \$8\$ pts. glacial phosphoric acid in \$32\$ pts. of water, and the oily layer (still containing a little of the watery solution) which rises to the surface is decanted. — 2. One hundred pts. of the baryta-salt are decomposed by a mixture of \$47.5\$ pts. oil of vitriol and \$47.5\$ pts. water, and the anhydrous acid which rises to the surface of the liquid is decanted. (The liquid below the oily layer yields, when neutralised with baryta-water, an additional quantity of caprate of baryta.) (Chevreul.) — B. From Limburg Cheese. (See xiii, 191.)—C. From Scotch fusel-oil. — The liquid is subjected to fractional distillation, whereupon water, alcohol, and fusel-oil pass over, and there remains a dark-coloured fætid oil, insoluble in water and in boiling aqueous carbonate of potash. When this oil is digested for several days with concentrated potash-ley, amyl-alcohol is separated, and there is formed a solution of caprate of potash, which, if mixed after cooling with hydrochloric or sulphuric acid, yields a dark-coloured oil, to be filtered and washed with cold water. For purification, the acid thus obtained is dissolved in very dilute aqueous ammonia, the solution precipitated by chloride of barium, and the precipitate separated by filtration, washed with cold water, and recrystallised from boiling water. Sometimes the precipitate dissolves but slowly in bot water, because it cakes to a hard mass during the boiling. The nearly colourless baryta-salt obtained by repeated crystallisation is decomposed by boiling with carbonate of soda; the liquid is filtered from the carbonate of baryta; and the filtrate is decomposed by dilute sulphuric acid, whereby nearly colourless solid capric acid is separated: it is to be dissolved in alcohol, precipitated by mixing the solution with a lar

Properties. White mass, composed of small needles. (Chevrent

Rowney.) Melts at 18° (Chevreul); at 30° (Görgey); when pure, partially at 27.2°, completely at 46.6° (Rowney): hence even at the heat of the hand (Görgey, Rowney); forming a yellow oil (Görgey); becoming somewhat coloured and emitting a faint odour (Rowney); solidifies in contact with the air at 15° (Chevreul); at 27.2°, crystalline (Rowney). — When cooled in closed vessels, it remains liquid at 11.5°, not solidifying till the vessel is opened and shaken. (Chevreul.) — Sp. gr. 0.9103 at 18°. (Chevreul.) — Boils above 100° and volatilises undecomposed. Its odour slightly resembles that of capric acid, and at the same time that of the goat. (Chevreul, Görgey.) Tastes sour, burning, somewhat like goat. (Chevreul.)

With pentachloride of phosphorus, it forms volatile chloride of caprinyl, ConClH19O2, which is resolved by potash-ley into chloride of potassium

and caprate of potash. (Cahours.)

Combinations. Capric acid dissolves in about 1000 pts. of water at 21°. (Chevreul.) It dissolves (very little according to Rowney) in boiling water, and on cooling separates almost completely (in scales, according to Rowney), so that the water scarcely retains any acid reaction. (Görgey.)

It dissolves in strong nitric acid, and is precipitated therefrom by

water in its original state. (Rowney.)

With Bases.—Caprates.—All caprates, excepting those of the alkalis, dissolve but sparingly in water. (Lerch.) The caprates of the earths, and likewise the silver-salt, are insoluble in water; when dry they float on the surface without being wetted, and become soluble only after being treated with alcohol. (Rowney.) They are unctuous to the touch and become electrical by friction. (Fehling, Handwörterb. Supplem. 715.)

Caprate of Ammonia. - Difficult to obtain pure. (Rowney.)

Caprate of Soda. — Remains, after the evaporation of the aqueous or alcoholic solution, as a horny somewhat crystalline mass. Dissolves in warm absolute alcohol, and forms a translucent mass on cooling. (Rowney.)

Caprate of Baryta (p. 486).—1. Baryta-water is neutralised with capric acid, and the solution quickly cooled after evaporation. (Chevreul.)—2. Caprate of ammonia is precipitated by chloride of barium, and the baryta-salt which separates is collected and washed with cold

water. (Rowney.)

Prepared by the first process, it forms thin, very light scales (needles, according to (Lerch) of a fatty lustre (silky, according to Redtenbacher); by spontaneous evaporation of the solution, it separates in dull grains of the size of hemp-seed (Chevreul); likewise in thin cohering scales, different from the granules of caprylate of baryta (xiii, 192). (Lerch.) From aqueous alcohol, it crystallises in needles and prisms. (Rowney.) — Permanent in the air at mean temperature and at 100°. Does not contain water of crystallisation. (Lerch.) In vacuo over oil of vitriol, it gives off 2.4 p. c. water, without further change. (Chevreul.) Calculation 1 At. Aq. = 3.6 p. c. Smells of capric acid, with somewhat of a goat-like odour, especially when rubbed in the moist state between the fingers. Tastes bitter, alkaline, and of capric acid. Has an alkaline reaction. (Chevreul.) When heated, it softens, emits an empyreumatic and goat-like odour, melts and turns brown, giving off an odour like that of the Labiatæ, and leaving carbonate of baryta mixed with charcoal. (Chevreul.) By distillation, it yields a reddish, yellow, neutral, partly solidifying oil,

gives off olefant gas, with a small quantity of carbonic acid, and leaves

carbonate of baryta mixed with charcoal. (Chevreul.)

Dissolves in 200 pts. of water at 20°. (Chevreul.) According to Chevreul, the solution decomposes when exposed to air; according to Lerch, it is permanent in the air. It is but slightly precipitated by carbonic acid. (Chevreul.) It dissolves in boiling alcohol. (Rowney.)

			Lerch.	Iljenko & Laskowsky.		
20 C	120.0	50.08	50.26	50.05	50-41	49.73
19 H	19.0	7.93	7.87	7.83	8.01	8-15
3 0	24.0	10.02	10.17	10.44	9-86	10:35
BaO	76-6	31.97	31.70	31.68	31.72	31-77
C20H19BaO4	239.6	100.00	100.00	100-00	100.00	100-00

Contains 36:08 p. c. BaO (Chevreul); 32:07 p. c. BaO. (Redtenbacher.)

Caprate of Strontia. - Obtained by saturating strontia-water with capric acid, and leaving the solution to evaporate. - When heated, it melts, blackens, and gives off an aromatic and empyreumatic odour. Dissolves in 200 pts. of water at 18°. Contains 27.62 p. c. Sro. (Chevreul.) (C**0H19SrO' = 24·11 p. c. SrO.) According to Chevreul, it is C18HUSrO'; calculation, 26·19 p. c. SrO.

Caprate of Line. — Crystallises from the hot aqueous solution in very fine shining laminæ; very bulky. (Gottlieb.) Resembles the barytasalt, but is more easily soluble in hot water and in alcohol. (Rowney.) Contains 14.79 p. c. CaO (Gottlieb), and is therefore C20H19CaO (calculation

= 14.66 p. c. CaO).

Caprate of Magnesia. - Crystallises like the baryta-salt and resembles it in other respects; but dissolves more readily in hot water and in alcohol.

Contains 11.37 p. c. MgO (C²⁰H¹⁹MgO⁴ = 10.92 p. c. MgO.)

Caprate of Lead. — The combination of capric acid with oxide of lead is attended with evolution of heat. (Chevreul.) The salt is insoluble in water, and very slightly soluble in hot alcohol, whence it crystallises in rounded grains on cooling. (Rowney.)

Caprate of Copper. - Insoluble in water and in alcohol; soluble in

ammonia. (Rowney.)

Caprate of Silver. - The solution of capric acid in a slight excess of ammonia is precipitated by nitrate of silver. - The salt is insoluble in cold, sparingly soluble in boiling water, and crystallises in needles from the solution on cooling. It is very soluble in ammonia, and crystallises from the solution when left to stand in a warm atmosphere. (Rowney.) It dissolves more readily in boiling alcohol than in water, and the solution yields darker-coloured crystals. (Rowney.)—It blackens when exposed to the air in the moist state, but not when dry. (Rowney.)

Dried in vacuo	over	oil of	vitrio!.		Rowney.
20 C	120	1111	43.01		42-43
19 H	19		6.81	*******	6.77
AgO	116	1111	41.57	*******	41.64
30	24		8.61	*******	9-16
C20H19AgO4	279		100.00	nnmi	100.00

Capric acid mixes in all proportions with absolute alcohol. (Chevreul.) It dissolves in ether. (Rowney.)

Caprate of Ethyl.

$C^{24}H^{24}O^4 = C^4H^6O_1C^{20}H^{19}O^3.$

ROWNEY. Ann. Pharm. 79, 236.

Capric ether, Caprinsaures Aethyloxyd, Caprinvinester.

When a solution of capric acid in absolute alcohol is saturated with hydrochloric acid gas and precipitated by water, capric ether separates on the surface of the liquid, as an oil, which must be removed, washed with cold water, dehydrated by chloride of calcium, and rectified.

Oil of sp. gr. 0 862.

Insoluble in cold water; easily soluble in alcohol and in ether.

Appendix to Capric Acid.

Oil of Rue.

WILL. (1840.) Ann. Pharm. 35, 235.

CAHOURS. Thèse presenté à la faculté des sciences, le 15 Janvier, 1845, 132; Compt. rend. 26, 262. — Further, Chem. Soc. Qu. J. 3, 240.

GERHARDT. N. Ann. Chim. Phys. 24, 96; J. pr. Chem. 45, 327; Compt. rend. 26, 226.

R. WAGNER. 46, 155; further, 52, 48.

Спюдда. Compt. rend. 35, 797; J. pr. Chem. 58, 216.

BERTAGNINI. Ann. Pharm. 85, 283.

C. GREVILLE WILLIAMS. Phil. Trans. 1858, 199; Chem. Centr. 1858,

HALLWACHS. Ann. Pharm. 113, 107.

Capric aldehyde, Caprol, Hydride of Rutyl .- First examined by Will.

The volatile oil of rue, obtained by distilling garden rue, Ruta graveolens, with water, was long regarded, according to the results of Cahours & Gerhardt, as capric aldehyde, C²⁰H²⁰O²; but according to the more recent investigations of G. Williams, which have been confirmed by Hallwachs, it is chiefly = C²²H²²O², and is regarded by Williams as enodic aldehyde mixed with a small quantity of lauric aldehyde; by Hallwachs, as a compound not belonging to the class of aldehydes.

Fresh rue yields 3.4 grains of oil per pound; dry rue, 18; the dry flowers, 15; the seeds, 17 grains. (Zeller, N. Jahrb. Pharm. 1, 30.)—Crude oil of rue is greenish yellow, has a strong unpleasant smell of rue, and a sharp bitterly aromatic taste. Sp. gr. = 0.837 at 18°. It contains 77.5 p. c. C, 12.87 H, and 9.56 O (Will.); 77.65 p. c. C, 12.80 H, and 9.55 O. (Gerhardt.) — Oil of rue is supposed by Wagner to exist: in train-oil, in butter, in rich cheese, and in herring, inasmuch as train-oil heated with oil of vitriol, and then mixed with excess of hydrate of potash, gives off an odour of oil of rue, and the alkaline mixture yields by distillation drops of oil smelling of rue.

The manufacture of the same is a series allehyde by the small and the same is a series and collecting to the same is a series in the same is a series of the same is a series a crystalline in the same is a series a series and laure is a series in the same is a series and in the same is a series in the same in the same is a series in the same in the same is a series and same in the same is a series in the same in the same is a series in the same in the same is a series in the same is a series in the same in the same is a series in the same in the same is a same in the same is a same in the same in the same is a same in the same is a same in the same is a same in the same in the same in the same is a same in the same in the same in the same is a same in the same in the same in the same in the same is a same in the same in the same is a same in the s

Forester. Collections oil having a faint agreeable odour of me Hi withs, whichfulg completely, in shining laming between 11 in 1 - 1 full tree Bolling point vid sup.). Sp. gr. of the month in the tree collection and 245 = 0.838. (Will.) — Vapour leaver field Gerhardt 17822 Will., 5.87 (Williams).

Car later are rdin	g to	Cahour	s & Gerhardt.
29 €	120	••••	76-92
2) H	20		12.82
20	ló	•••••	10.26
C ₅ H ₅ O ₅	156	•••••	100.00

Calculation according to Williams.

22 C 22 H 2 O		2	1:	2.94		24	C H O	2	24		13-04
C-H-O	17	0 .	100	0.00		Call	I=1O2	. 1:	31	1	00.00
	Will.		Gerhard	lt.	Cahour	s.	w.		ms. b.	1	Hallwa by
C 11 O	12.62		12.86	••••	12.83	•	77·71 13·07	••••	78·1 12·9	****	1296
	100.00		100.00		100.00		100.00	••••	100.0		100-00

C-vapour H-gas O-gas	Vol. 20 20 1	Density. 8:3200 1:3860 1:1093				Vol. 22 2 2 2	****	Density. 9:1520 1:5246 1:1093
Capric Aldehyde	2	10·8153 5·4076		c A	ldehyde	2	****	11·7859 5·8929
	w		Vol.		Density.			
	C-vapour		24	***	9.9840			
					1.6632			
	J-gas		1	****	1.1093			
	Lauric ald	lehyde	2		12·7565 6·3782			

All the analytical results are mean numbers. Will originally gave the formula C*H**O³. The oil a analysed by Williams is his enodic aldehyde; b his lauric aldehyde. Hallwachs found the portion which passed over between 205° and 240° to be of uniform composition throughout.

Decompositions. 1. Slightly heated oil of rue (prepared by 3), is easily inflammable and burns with a bright, slightly coloured flame. (Hallwachs.) — In contact with iodine, oil of rue becomes viscid and brown-red (Flaschhoff, Br. Arch. 33, 225), but does not form any product analogous to anisoin. (Will, Ann. Pharm. 65, 230.) - 3. It absorbs dry chlorine gas abundantly, becoming hot, giving off hydrochloric acid gas, and thickening. (Will.)—4. Alcoholic oil of rue (prepared by 1), through which hydrochloric acid gas is passed, is converted, without change of composition, into metacaprol. (Gerhardt.)—5. Oil of rue is attacked by fuming nitric acid, with evolution of nitrous gas (Will); strong nitric acid converts it into capric acid, or, according to the duration of the action, likewise into pelargonic (xiii, 369), caprylic (xiii, 189), and conanthylic acid (xii, 451), with which also may be mixed acids containing a smaller proportion of carbon. (Cahours.) Nitric acid diluted with an equal quantity of water forms pelargonic acid; more diluted with an equal quantity of water forms pelargonic acid; more diluted with the control of the cont dilute nitric acid forms capric acid (Gerhardt); the more dilute acid likewise forms pelargonic, and after prolonged boiling, ultimately also suberic and sebacic acids. (Wagner, J. pr. Chem. 57, 435.) Under circumstances not yet thoroughly understood, nitroso-pelargonic acid (xiii, 371), may also be produced. (Chiozza.) — 6. With alcoholic hydrosulphate of ammonia, oil of rue forms, after a few days, white shining crystals which are decomposed by recrystalisation. They are probably Con High and related to capric aldebyde in the same manner. probably Con H16S4, and related to capric aldehyde in the same manner as thialdine to acetic aldehyde, inasmuch as, when boiled with potashley, they yield ammonia, capric aldehyde, and hydrosulphate of potash. (Wagner.) - 7. When oil of rue is heated to the boiling point with potash-lime, it resinises, without giving off gas, and leaves a yellowish residue, from which hydrochloric acid separates resin and a large quantity of unaltered oil. (Gerhardt.) — 8. Oil of rue distilled with 8 pts. of chloride of lime and 24 pts. of water, yields chloroform. (Chautard, Compt. rend. 34, 485; J. pr. Chem. 56, 238.) — 9. By the passage of its vapour over melting chloride of sinc, it is converted into a hydrocarbon. (Gerhardt.) - 10. Ammoniacal silver-solution is quickly reduced by boiling with oil of rue. (Gerhardt.) If the boiling with excess of ammoniacal silver-solution be continued as long as any reduction of silver takes place, the filtrate yields with aqueous potash, a precipitate of oxido of silver, which, when dissolved in dilute sulphuric acid, leaves a small

country of neural of silver, while the alkaline liquid filtered from the timbe if silver countries a little capric acid. (Wagner.) — From these exterments. Vagner inters the existence of an acid corresponding to acidentific and with 1811 with our majorus acide C[®]H^mO³, or in the 172, any pictures since = C[®]H^mO³ — 11. In contact with dry nitro-prussile to open of it was becomes forwards yellow and forms an ash-grey legion. Majore, N 25, 2 mil 83, 57.)

I militations. But if the lists lives in oil of ritriol, with a fine list with the list water. (Will.) — his sample ultered in hydrocline and his merely acquiring a brown one in which theses in limitation with water. Will.)

With an analast with the limitation with ammonia, a white creately a sample of supplies that the creately services as a supplier with ammonia as white creately services.

Will have any — NH [2H2] 21. When oil of rue dissolved in hood as sampled in a live temperature with ammonia, a white crystaline mass is formed which make it about 11, and is resolved into ammonia and its form. Whenever, Whenever regards these crystals as a composition of turning a with matter this piece. For the decomposition of capit

possible in the state of the property of the decomposition of capit the internal at the property of the decomposition of capit the internal at the decomposition of capit the internal at the property of an array of the west through an internal cit of rue, and the solution left the several lars in a very collines, crystalline laminum are deposited. Therefore, in a very collines, crystalline laminum are deposited at mounts of it. To the internal at the commencement of the composition of the property is recrystalline from warm alcohol.

The compositions have related in crystalline laminum, by passing annual a last substances that rases into an alcoholic solution of oil of the composition of t

	. J. 9.	 	; :	Betternini.	W
2.		::	43	44-12	-
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		•	 23

compound dissolves with tolerable facility in boiling alcohol, and the

with Bisulphite of Soda. — Oil of rue in contact with aqueous bisulphite of soda, of 27° Bm. forms a buttery mass, which after a while becomes crystalline. — Shining crystalline scales, unctuous to the touch, having the smell of oil of rue and a fruity taste. — The concentrated, but not the dilute solution of the compound in boiling alcohol, solidifies on cooling to a gelatinous mass, changing in the course of 24 hours into delicate laminæ, arranged concentrically in spherical crystalline masses. (Bertagnini.)

Metacaprol.

GERHARDT. N. Ann. Chim. Phys. 24, 105.

When oil of rue (prepared as described at p. 490, 1) is dissolved in 3 or 4 vol. alcohol and excess of hydrochloric acid gas is passed into the solution, the brown and fuming mixture, if mixed with water after the most volatile portion has been distilled off, deposits metacaprol.

Oil having a highly agreeable fruity odour. Solidifies, after a while, at a temperature at which oil of rue remains liquid, and melts again at

13°. Boils between 230° and 235°.

				(Berhardt
20 C	120		76.92		77.10
20 H	20		12.82	*******	12.95
2 0	16	****	10.26		9.95
C20H20O2	156		100.00		100.00

Isomeric with capric aldehyde. (Gerhardt.)

Dissolves in oil of vitriol almost without colour. On heating the mixture, a conjugated acid is formed, the baryta-salt of which is soluble in water. It is not altered by caustic potash or by nitrate of silver.

Oxygen-nucleus C20H18O2.

Sebacic Acid.

 $C^{20}H^{18}O^{8} = C^{20}H^{18}O^{2}, O^{6}.$

THÉNARD. (1802.) Ann. Chim. Phys. 39, 193; Schw. J. 8, 127. V. Rose. A. Gehl. 275, 3, 170. Berzelius. N. Gehl. 2, 275; Lehrbuch. 3, Aufl. 8, 667. Dumas & Peligot. Ann. Chim. Phys. 57, 332; Ann. Pharm. 14, 73. REDTENBACHER. Ann. Pharm. 35, 188. St. Evre. N. Ann. Chim. Phys. 20, 93; J. pr. Chem. 41, 144. Schliefer. Ann. Pharm. 70, 121; Pharm. Centr. 1849, 459. Bouis. Compt. rend. 33, 141.—N. Ann. Chim. Phys. 44, 100; 48, 99; Ann. Pharm. 80, 303; 97, 34.

W. MAYER. Ann. Pharm. 83, 143; 95, 160.
ROWNEY. Chem. Soc. Qu. J. 4, 334; Ann. Pharm. 82, 123; J. pr. Chem. 55, 325.

CARLET. Compt. rend. 37, 129; J. pr. Chem. 60, 181; N. J. Pharm. 24, 176.

Brenzoleic acid, Pyroleic acid, Sebacylsäure, Fettsäure. Discovered in 1802 by Thénard, who at the same time showed that the product of the distillation of animal fat, to which the name of Fettsäure or Acide gras had been applied by Crell (Crell. chem. J. 1, 60; 2, 112; 4, 47), and Guyton Morveau, consisted partly of acetic, partly of hydrochloric acid. Thénard's experiments were confirmed by V. Rose. Berzelius regarded Thénard's sebacic acid as identical with benzoic acid, an opinion which was shown to be incorrect by the experiments of Dumas & Peligot.

Mayer's ipomæic acid (not Sandrock's, N. Br. Arch. 64, 164), agrees with sebacic

Mayer's ipomæic acid (not Sandrock's, N. Br. Arch. 64, 164), agrees with sebacic acid in most of its relations, but melts at a different temperature and exhibits a different behaviour to bases: for this reason, the statements respecting it are given separately.

Formation. 1. By the dry distillation of hog's lard (Thénard), fat oil (Berzelius), and other fats, in so far as they contain oleic acid: hence also by the dry distillation of oleic acid. (Redtenbacher.)—2. When ricinolate of potash or castor-oil is distilled with excess of potash-hydrate, hydrogen is given off, caprylic alcohol (p. 183) passes over, and sebate of potash remains behind. (Bouis.)—The largest amount of sebacic acid is obtained when a large excess of alkali is used and the mixture is rapidly heated to the melting point, whereas by slow heating to at most 225°—230°, neither sebacic acid nor caprylic acid is obtained, but the acid C²⁰H¹⁸O⁴ and caprylic aldehyde. (Bouis.)—Limpricht (Private communication) by using an excess of alkali, always obtained sebacic acid, whether caprylic alcohol or caprylic aldehyde was produced; similarly Malaguti (Cimento, 4, 401; Liebig u. Kopp's Jahresber. 1856, 579). According to Dachauer (Ann. Pharm. 106, 270), the products obtained with excess of alkali, are caprylic alcohol, methyl-manthyl (isomeric with caprylic aldehyde), and sebate of potash; (according to Städeler, J. pr. Chem. 72, 241), cenanthylic alcohol, and sebate of potash (see xii, 587).—3. By continued boiling of oil of rue with dilute nitric acid. (Wagner, J. pr. Chem. 57, 435.)—4. Convolvulie acid, convolvulinolic acid, jalapin, jalapic acid, and jalapinolic acid, treated with moderately strong nitric acid, or with the fuming acid, yield ipomæic and oxalic acids. (Mayer.)

Preparation. Method II. is the most advantageous.—1. From Olive oil, Hog's lard, or other fats containing Oleic acid. Crude oleic acid from the stearin manufactories is best adapted for the purpose. (Redtenbacher.)—1. The fat is distilled per se, and the distillate is repeatedly treated with hot water, then filtered, and evaporated to the crystallising point.—Or the solution obtained by treating the fat with hot water is precipitated with neutral acetate of lead; and the precipitate is collected and decomposed by heating with dilute sulphuric acid, whereupon the sebacic acid rises to the surface as a melted mass, which is taken off, washed with cold water, and recrystallised from boiling water. (Thénard.) Redtenbacher likewise obtains sebacic acid from the products of the distillation of fats by repeated boiling with water, and purifies it by recrystallisation, till it becomes white and scentless.—Berzelius washes the distillate of fat oil with cold water to separate acetic acid, and then boils it with coarsely powdered carbonate of lime, whereby only the sebacic acid is converted

into a lime-salt, not the other acids. After long-continued boiling, the solution is filtered, deodorised with charcoal, and mixed with nitric acid, whereby sebacic acid is precipitated: it may be purified by washing with cold water, recrystallisation from boiling water, and finally by sublimation, in the apparatus used for the subliming benzoic acid.

2. The distillate of crude commercial oleic acid is repeatedly boiled with water; the extracts are saturated with carbonate of soda, and evaporated to dryness; and the residue is freed from caprylate and caprate of soda by means of hot absolute alcohol. The undissolved sebate of soda is dissolved in water and precipitated by hydrochloric acid, and the sebacic acid thereby separated, is purified by recrystallisation from boiling water. The still yellow sebacic acid obtained by this and other methods, is obtained pure by once boiling it with 5 to 6 pts. of nitric acid, and pouring the solution into a large quantity of boiling

water, whereupon it crystallises on cooling. (Schlieper.)

II. From Castor-oil. The residue left in the retort in the preparation of caprylic alcohol (xiii, 183) is decomposed by hydrochloric acid, and the sebacic acid is extracted by boiling water from the mixture of insoluble acid which separates. (Bouis.) - Petersen boils the residue with water; strains; precipitates the other fatty acids by adding a small quantity of hydrochloric acid; then, after separating these by filtration, precipitates the sebacic acid by excess of hydrochloric acid, and purifies it by recrystallisation from hot water with the aid of animal charcoal.

(Ann. Ch. Pharm. 103, 184.)

Properties. White, pearly needles, very much like those of benzoic acid. (Redtenbacher.) Under certain circumstances, it may be obtained in long, large, strongly shining laminæ. (Thénard.) Bulky and of a feathery lightness. (Berzelius.) — Ipomæic acid is dazzling white, of feathery lightness, and presents under the microscope the appearance of thin colourless needles, some of which are united in tufts, while others lie separate, sometimes in very thin flexible laminæ. (Mayer.) Sebacic acid melts at 125° (St. Evre), at 127° (Redtenbacher, Mayer, Bouis), to a colourless oil which solidifies in the crystalline form on cooling, and sublimes at a higher temperature, partly pulverulent, partly in minute laminæ, generally with some decomposition and separation of charcoal. (Berzelius, Redtenbacher). Ipomæic acid melts at 104° to a colourless oil, lighter than water, and solidifying in the crystalline state. It sometimes sublimes between two watch-glasses in very small, proportionally short needles radially grouped round a point, leaving a small quantity of charcoal, whereas sebacic acid sublimed in like manner, forms larger and more definite crystals. (Mayer.) — Sp. gr. of melted sebacic acid = 1-1317. (Carlet.) Scentless (Thénard); has a faint empyreumatic odour (Berzelius). The vapours, both of sebacic and of ipomæic acid, produce a scratching sensation when inhaled. (Redtenbacher, Mayer.) Has a faint, rather acid taste (Thénard), pungent, but not exactly sour (Berzelius). Reddens litmus strongly (Thénard), slightly (Redtenbacher). Ipomæic acid is scentless, has a pungent, sour taste, with irritating aftertaste, a slight acid reaction, and becomes strongly electrical by friction. (Mayer.)

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Bull. 1, 88; Rep. Chim. pure, 2, 127.) - 6. When alcoholic sebacic acid is treated with hydrochloric acid gas, an oil is produced which with ammonia forms sebamide and sebamic acid, and is therefore probably a mixture of sebacic ether and ethylsebacic acid. (Rowney, see page 502.)

Combinations. Sebacic acid dissolves sparingly in cold water. It dissolves abundantly in boiling water (Thénard); in all proportions (Berzelius), so that the solution solidifies on cooling. Ipomæic acid is

slightly soluble in cold, very easily soluble in hot water. (Mayer.)
Sebacic acid is bibasic. Its semi-acid or bibasic (neutral) salts are C20M2H16O8. The mono-acid or monobasic (acid) salts are, excepting the ammoniasalt, easily decomposible. (Carlet.) It decomposes alkaline carbonates, forming with them, easily soluble salts, whose solutions precipitate the salts of the alkaline earths and heavy metallic oxides (not ferrous salts, according to Berzelius). Acids separate sebacic acid from them and cause concentrated solutions to solidify. Aqueous sebacic acid does not precipitate baryta-, strontia-, or lime-water. It precipitates lead-, silver-, and mercuric-salts. (Thénard.) Sebacic acid obtained from marrow does not precipitate lead- or silver-salts, or only if prepared from marrow having membranes or blood-vessels adhering to it. (Berzelius.) Berzelius likewise found that sebate of potash is divided by absolute alcohol into two parts, and that only the acid of the insoluble, not that of the soluble salt, precipitates lead and silver-salts. Redtenbacher, however, did not succeed in separating from his sebate of potash by absolute alcohol, a salt whose acid did not precipitate mercurous and silver salts.

The ipomæates, excepting those of the alkalis, are sparingly soluble or insoluble in water. Ipomæate of ammonia forms a white precipitate with lead-salts, flesh-coloured with ferric chloride, bluish-green with cupric salts, and white with silver-salts. With bichloride of platinum, it forms a yellow precipitate which dissolves in boiling water, separates again on cooling, and then becomes crystalline after long standing. - The

ipomæates become electrical by friction. (Mayer.)

Sebate of Ammonia.—a. Bibasic.—Indistinct crystals, which are easily soluble in water, and in drying, give off ammonia and turn acid. (Redtenbacher.) Yields sebamic acid by dry distillation. (Kraut.)

b. Monobasic.—The easily prepared solution of sebate acid in

excess of ammonia gives off ammonia when evaporated, and leaves the monobasic salt, sparingly soluble in water. Crystallises from boiling water by slow cooling, in pointed feathery crystals; by rapid cooling, in small grains. Dissolves with difficulty in alcohol. (Berzelius.) — Ipomæic acid, saturated with aqueous ammonia, continually gives off ammonia by spontaneous evaporation or on the water-bath, and yields a white cauliflower-like salt, probably C20H17O7,NH4O, therefore ipomæate of

Sebate of Potash. — Bibasic. — Obtained by neutralising the acid with carbonate of potash. Small granular nodules. (Redtenbacher.) Does not deliquesce on exposure to the air. (Thénard, Redtenbacher.) Easily soluble in water, sparingly in absolute alcohol. (Redtenbacher.)

				Rec	dtenbacher.
20 C	120.0		43-11	*******	43.00
2 KO	94.4	****	33.91		
16 H	16.0	****	5.74	********	5.94
6 O	48.0	***	17.24	*******	
C20K2H16O8	278.4	****	100.00		

Former cases for any rotate an and select of potash by treating the neutral sak rm - han a a

All to the Solly resembles the potash-salt. But is somewhat more a product with a Believe Levil Institute in absolute alcohol

Here the state of the product of the precipitate which dissolves with some difficulty in vite to the product the symbolation of its dilute solution, in vite the first state. Relients then, The precipitate symbolation of the dilute solution, in vite the first state of amount and chloride of calcium is crystalline vite to the first vite and the product by ipomerate of amount termes the first of the first stateing for some time. (Mayer.)—
In the periods who may also say by isolation, see page 497.

			Re	dtenbacher.
11.7	::-	\$0:00		49-49
<u>:</u>	3-€	23:33	•••	22-91
14 E .	1:	6-67		6.76
1.1	4.5	2(nn)		20.84
LEFE		16000		100.00

Since of I will—The white precipitate insoluble in water, which sends appropriate varies at the finential acetate of lead, is consequent at the first varies said. Berzelius.)—The precipitate of the first varies of ammonia, is a window vary as the five set which after drying over oil of vitrich at the February Park of the field and is therefore C*Pb'H'*O* (calculate with February February Calculate with February Fe

Since the first tracted with a queens carbonate of the first tracted with a queens carbonate of the first tracted with red colour, leaving the first tracted by the first tracted swells up, and decomposes

The straight which soluble selectes produce in the last less lives at first, but become the straight with soluble after the evaporation of the last less than and exhibits a first less than the crust and deposits greater than the straight at the position of the form the straight of silver is precipitated by the last less than the straight of the form the straight of the form the straight of the precipitate is when the straight over the silver is precipitated by the straight over the straight over only of this

and Store of the Religious White, rather light powers The state of the second of the

				Redt		Mayer.	
20 C	120	••••	28.84	••••••	29.19		29.14
2 AgO	232	••••	55.76		55.45	••••	54.89
16 H	16	••••	3.84		3.97	••••	4.02
6 O	48	••••	11.56	•••••	11.39	••••	11.95
C20Ag2H16O3	416		100.00		100.00	••••	100.00

Contains 54.9 p. c. oxide of silver. (Dumas & Peligot.)

Sebasic acid dissolves readily in *alcohol*, in ether, and in oils, both fixed and volatile. (Berzelius.) — Ipomæic acid dissolves readily in alcohol and in ether. (Mayer.)

Sebate of Methyl.

 $C^{24}H^{22}O^{8} = 2C^{2}H^{3}O,C^{20}H^{16}O^{6}.$

HENRY CARLET. (1853.) Compt. rend. 37, 129; N. J. Pharm. 24, 176; J. pr. Chem. 60, 181; Pharm. Centr. 1853, 669; Chem. Gaz. 1853, 324.

Methylsebacic ether. Sebacylformester.

Formation and Preparation. Sebacic acid is dissolved in oil of vitriol, wood-spirit carefully added, the liquid being agitated and cooled to prevent too great heating; and the resulting ether is precipitated by water, washed first with alkaline, then with pure water, and crystallised from alcohol.

Beautiful needles, which melt at 25.5°, and boil without decomposition at 285°. In the solid state, it dissolves in water with comparative difficulty, in the fused state more readily. Has a very faint odour.

By ammonia it is converted into sebamide and wood-spirit, by hydrate of potash, into sebate of potash and wood-spirit.

Sebate of Ethyl.

 $C^{26}H^{26}O^{8} = 2C^{4}H^{5}O, C^{20}H^{16}O^{6}.$

REDTENBACHER. (1840.) Ann. Pharm. 35, 193.

Sebacic ether, fettsaures Aethyloxyd, Fettnaphta, Sebacylvincster.

Formation and Preparation. Sebacic acid is dissolved in a small quantity of alcohol; hydrochloric acid is passed into the solution to saturation; and the chloride of ethyl thereby produced is volatilised by gentle heating. The residue is washed with water, then with aqueous carbonate of soda, dehydrated by chloride of calcium, and rectified. (Redtenbacher.) — Alcoholic sebacic acid, treated with hydrochloric acid gus, yields a mixture of sebacic ether and ethylsebacic acid. (Rowney, Ann. Pharm. 82, 124.)

Properties. Colourless oil, lighter than water. Solidifies in the

restaline into at -F. Buls above 100° (Redtenbacker), at 308° luner. Imps. rat. F. 131. Has an agreeable odour of melous.

				Re	tesbecker.
5 :	12	_	63-12		64-45
5 至					
± 2	64	_	24-50		25:31
いるいしゅこん	256	_	100-00		100-00

For infinite of passes, it is resolved into alcohol and sebate of potals Latinenius and action, converts it into sensurate. Latiner

It is insulative in said water, but dissolves very easily in alcohol.

Sehin.

 $C^{\infty}H^{\infty}O^{\infty} = 2C^{\alpha}H^{\alpha}O^{\alpha}, C^{\infty}H^{\infty}O^{\alpha}.$

M. Farrendt N. Ann. Chim. Phys. 41, 293.

Furnation. Science and heated with glycerin to 200 for some arms, items a sum (manaly of neutral crystallisable sebin:

$$C^{n}\Xi^{n}\mathcal{F} + 2C^{n}H^{n}O^{n} = C^{n}H^{n}O^{n} + 4HO.$$

2. By the activa of hydrochlode acid gas on a mixture of sebacic added 1 program beated to 100 a considerable quantity of liquid sebin is common mane, which relicityistic. CHClO', which, after strong drying at 1000 samples partially after a few days, and completely at —400.

np -	152		34-53	•	52.7
u =	31	.	ē-57		9.6
	125	_	36.23	••••	37.7

From armie's when heated. — Oride of lead converts it into seback and sub-givenus: with sleakeds hydrochloric acid, it yields sebacic ether and givenus. — Berthelm.)

N сто-явойскі $C^{\mathbf{x}}XH^{\mathbf{p}}$.

Nitrocapric Acid.

 $C_{x}XH_{x}O_{t} = C_{x}XH_{x}O_{t}$

Wiks (1857.) Ann. Phirm. 104, 289.

Obvined by the process described at page 217, vol. xiii, but misel with nitrocaptylic acid, from which it cannot be completely separated

When the solution of this mixture in ammonia is fractionally precipitated in three portions by nitrate of silver, the precipitate first produced contains 28.89 to 29.3 p. c. silver, the second portion 32.8 to 33.3 p. c., and the last 37.4 p. c., corresponding to nitrocaprylate of silver.

Nitrocapr	Nitrocaprate of Silver.					
20 C	120		37.0		33.57 to 35.97	
N	14	••••	4.3	• • • • • • • • • • • • • • • • • • • •		
18 H	18	••••	5.6	*******	5.14 ,, 6.30	
Ag	108	••••	33.3		34.04 ,, 31.90	
8 O	64	••••	19.8	•••••		
C20AgXH18O4 8	324		100.0	•••••		

Amidogen-nucleus C20 AdH10.

Capramide.

 $C^{20}NH^{21}O^2 = C^{20}AdH^{19},O^2$.

ROWNEY. Ann. Pharm. 79, 236.

Rutamide.

Caprate of ethyl dissolved in alcohol is precipitated by strong aqueous ammonia, till the ether disappears and is completely converted into crystals; and the crystals are collected,—an additional quantity being obtained from the mother liquor by evaporation to dryness, solution of the residue in alcohol, and precipitation by water,—and recrystallised from warm dilute alcohol.

Colourless shining scales, acquiring a silvery lustre when dry. Melts below 100°.

				Rowney.		
20 C	120		70.17	*******	70.62	
N	14	••••	8.18	•••••		
21 H	21	••••	12.28	•••••	12.17	
2 O	16	••••	9.37	•••••		
C20 A 3H 19O2	171		100:00			

Insoluble in water and in ammonia.

Dissolves readily in cold *alcohol*, and is precipitated therefrom in needles by water. Easily soluble in *ether*, but does not crystallise therefrom.

Oxyamidogen-nucleus C²⁰AdH¹⁷O².

Sebamic Acid.

 $C^{20}NH^{19}O^6 = C^{20}AdH^{17}O^2,O^4.$

ROWNEY. (1851.) Chem. Soc. Qu. J. 4, 334; Ann. Pharm. 82, 123; J. pr. Chem. 55, 325.

Fettaminsäure, Sebaminsäure, Sebacylaminsäure.

Formation. 1. By the action of ammonia on ethylsebamic acid. (Rowney.) — 2. By the dry distillation of neutral sebamate of ammonia. (Kraut.)

Preparation. 1. The oily mixture of sebacic ether and ethyl-sebacic acid obtained by the action of hydrochloric acid gas on an alcoholic solution of sebacic acid, is digested with strong aqueous ammonia for several weeks in a closed vessel, or till the oil is converted into a granular mass, the sebamide which separates from the liquid containing sebamic acid, being removed by filtration, and washed to free it from mother-liquor. The several portions of liquid are then united and concentrated over the water-bath; the sebamic acid is precipitated by hydrochloric acid, washed with cold water, and dissolved in dilute aqueous ammonia, which still leaves a small quantity of sebamide undissolved; the solution filtered therefrom is again precipitated by hydrochloric acid; and the resulting precipitate, after being washed, is purified by recrystallisation from water. (Rowney.)—2. Neutral sebate of ammonia yields by simple distillation, first a colourless, then a yellowish empyreumatic distillate, which is to be dissolved in ammonia, filtered from a small quantity of oil which separates, and precipitated with hydrochloric acid. The precipitate is washed with cold water, and recrystallised from boiling water. (Kraut.)

Properties. Rounded granules. (Rowney.) White, crystalline, pulverulent mass. (Kraut.) Has an acid reaction. (Rowney.)

						Rowney.	D	Kraut. ried over oil of vitriol.
20 C.		120		59.70		59.65	****	59-98
N		14	****	6.97	********	6:70	***	7:09
19 H	***************************************	19		9.45	*******	9.53	****	9.81
60		48		23.88		24.12	-	23.12
C20 Ad	H17O6	201		100-00		100-00		100.00

Decompositions. 1. Gives off ammonia when boiled with potasi. (Rowney.) — 2. The soda-salt brought in contact with chloride of benzoyl, yields chloride of sodium and an oil, which may be dissolved out by ether, is left behind when the ether evaporates, gives off ammonia when fused with hydrate of potash, is insoluble in water and ammonia, and, when washed with ammonia, gives up to it only a small quantity of free acid. (Kraut.)

Combinations. Sparingly soluble in cold, easily in warm water.

Easily soluble in ammonia. (Rowney.) Boiled with carbonate of time, it gives off carbonic acid, and forms a lime-salt slightly soluble in water. (Kraut.) The solution of sebamic acid in ammonia does not precipitate the alkaline earths; it precipitates acetate of lead, and forms with nitrate of silver, a precipitate soluble in ammonia and in nitric acid. (Rowney.)

Sebamic acid is easily soluble in alcohol. (Rowney.)

Oxyamidogen-nucleus C20Ad2H16O2.

Sebamide.

$C^{20}H^{20}N^2O^4 = C^{20}Ad^2H^{16}O^2O^2$.

ROWNEY. (1851.) Chem. Soc. Qu. J. 4, 334; Ann. Pharm. 82, 123; J. pr. Chem. 55, 325.

H. CARLET. Compt. rend. 37, 128; N. J. Pharm. 24, 176; J. pr. Chem. 60, 181; Pharm. Centr. 1853, 669; Chem. Gaz. 1853, 324.

Fettsäureamid.

Formation and Preparation. 1. Sebamide obtained in the manner just described (p. 502). is purified by two recrystallisations from alcohol, (Rowney.) — 2. It is produced by the action of ammonia on sebate of methyl. (Carlet.)

Properties. Hard rounded granules composed of microscopic needles.

Neutral.

					Rowney. mean.
20 C	120		60.	• • • • • • • • • • • • • • • • • • • •	59.94
2 N	28	••••	14.	•••••	13.85
20 H	20		10.	•••••	10.01
4 0	32	••••	16.		16.20
C ²⁰ Ad ² 11 ¹⁶ O ⁴	200		100.		100.00

Decompositions. Water gradually converts it into sebate of ammonia. (Carlet.) It is not attacked by potash-ley in the cold, but gives off ammonia when boiled therewith. (Rowney.)

It is insoluble in cold, moderately soluble in boiling water. Insoluble

It is insoluble in cold, moderately soluble in boiling water. Insoluble in ammonia. Dissolves very sparingly in cold alcohol, very easily in boiling alcohol. (Rowney.)

Primary Nucleus C20H26: Oxygen-nucleus C20H18O6.

Anisoic Acid.

 $C^{20}H^{18}O^{12} = C^{20}H^{18}O^{8}, O^{4}.$

LIMPRICHT & RITTER. (1856.) Ann. Pharm. 97, 364; abstr. J. pr. Chem. 68, 160; Chem. Centr. 1856, 446.

Formation and Preparation. When oil of star-anise is heated with nitric acid of sp. gr. 1.2, as long as it floats on the surface of the acid, and the product is shaken up with a warm aqueous solution of bisulphite of soda, anisoate of soda crystallises on cooling. This salt is recrystallised from a small quantity of hot water, mixed with a quantity of dilute sulphuric acid exactly sufficient to decompose it, the solution evaporated

u irruss m the water-bath and the residue exhausted with absolute mention, whereanon missis and passes into an river and may be converted mm a increas or all resembles by Expending with carbonate of baryta or minimize in siver. It is commonsing the curve-calt with dilute caland a number when may be integrit to the crystallising point by Printer Line

Figures. Separate from warm solutions by concentration in small minima. In mountainess emplement in small thick tablets, which melt at sione III and mee a sering and reserve.

I-compositions. Heated in plantium-foll it turns brown, gives of an empyreumane token and that if anisylvas acid, and borns with a largest fame. It manus he assumed with the decomposition, and by dry mentioner appears in their a strictuate of anisic acid, vid. Ann. Pharm. F. 1991 .

Continuous Austinacii lissilves very easily in water.
This bases it forms the resource.

Lawre of Sold - Francisco y. 546. By recrystallisation from his winer, it is obtained in white expeculine modules. Dissolves readily in water. There is 100 to countrie 500 p. c. sodium, and is therefore CNAHTE marriagem = 50 p. c. Nat.

2 a some of Engra - Programme (sep.). Easily soluble nodule

resembling those if the spin-said

					Liz	richt & Ritter.
<u>:</u>	·	 ··		39.78		35-44
	E4	 1. I		22-74		22.59
:-	Έ	 		3.42	-	5.14
11	: : .	 \$: •:	•	21-53		32-73
<u>-</u>	ILE CO-	 1.14		13/40		100-00

As some of Silver. Charited as above described, or by decompositive largest such subjects of silver.
Crystalline redules, which in the moist state blacken on exposure to the

∑ - - ₫ :	::::::::::::::::::::::::::::::::::::::	fairch.		Lian	pricht &	Ritter
21.0		120	(3.13		34-1	
A.:		1.5	31.67		$32 \cdot 2$	
17 H		1;	4.93		4.0	
21.0		95	. 25.16		29.7	
C-ArH o)	. 341	. 100-00		100-0	

Aniscie acid disselves very readily in alcohol and ether.

Addenda to compounds containing 20 At. Carbon.

Product of the decomposition of Amalic Acid.

C20N4H14O11.

ROCHLEDER & SCHWARTZ. Wien, Akad. Ber. 12, 190.

Amalic acid (xi, 433) dissolves with pale yellow colour in warm concentrated bisulphite of ammonia, the solution when heated becoming darker and depositing needles, which, after boiling for some time, cause the liquid to solidify. The whole is left to cool, and the needles are collected, washed, and pressed.

White, silky needles, free from sulphur.

R۸	chle	der	g,	Sch	wartz.

In v	In vacuo.					
20 C	120		43.17	•••••	43.24	
4 N	56	••••	20.14		20.27	
14 H	14		5.04		5.38	
11 0	88	••••	31.65		31.11	
C20N4H14O11	278		100.00		100.00	

The compound acquires a rose-colour by exposure to moist air (containing ammonia). — It decomposes when heated, giving off colourless and purple smoke, consisting of crystalline spangles. — Left for some time in contact with bichloride of platinum, it decomposes, yielding light yellow crystals which contain 58.77 p. c. platinum, and are probably therefore Reiset's ammonio-platinous chloride (vi, 300; calculation 58.79 p. c. Pt.). Perhaps formed in this manner:

$$C^{20}N^4H^{14}O^{11} + HO + PtCl^2 = N^2H^6PtCl + C^{20}H^8N^2O^{12} + HCl.$$
 (Rochleder & Schwartz.)

The compound dissolves very readily in acids, but not in other liquids. The hydrochloric acid solution does not precipitate bichloride of platinum, even after addition of ether-alcohol.

T Derivatives of Sulphonaphthalic Acid.

KIMBERLY. Ann. Pharm. 114, 129; abstr. Rep. Chim. pure, 2, 258.

SULPHITE OF CHLORONAPHTHALIN. C²⁰H⁷Cl,2SO².—Naphthylsulphurous Chloride, Chlorier der naphtylschwestigen Saure.—Produced by the action of pentachloride of phosphorus on sulphonaphthalate of soda (p. 17):

$$C^{20}H^{8},2SO^{3} + PCl^{5} = C^{20}H^{7}Cl,2SO^{2} + PCl^{3}O^{2} + NaCl.$$

1 At. of the soda-salt dried at 100° is intimately mixed in a slightly heated capsule with 1 At. pentachloride of phosphorus; and the solidified mass is triturated and washed with water, till the oxychloride of phosphorous is completely decomposed and the chloride of sodium dissolved: the residue consists of sulphite of chloronaphthalin. It is purified by drying on filtering paper, dissolving in ether free from alcohol, filtering, evaporating, and drying at 100°.

White, iniderous solid body, which melts at 65° and solidifies at a hwer temperature in rounded lamellar masses. Partially volatile without decomposition, but begins to decompose, even at 120°.

6 0 C2 E101804	:	32.0	14-12	•••••	
28		32-0	11-19	*******	19.62
7 H		7:0 85:5	3.14		1
29 C					

May be regarded as $C^2H^{-1}C^2$, deriving from the mixed type H^{2O^2}

The sumpormi is decomposed by mater and by the aqueous and also have seemens of recess especially with the aid of heat, yielding hydro chlorie and and sply honaphthalic acid:

With absolute allegable it forms hydrochloric acid and sulphonaphthalae

$$C^{2}H^{2}C^{2}ISO^{2} + C^{2}H^{2}C^{2} = HCI + C^{2}H^{2}(C^{2}H^{2}),2SO^{2}$$

Sulvàite of chloromaphthalin is insoluble in water, but dissolve in sulvà de plantice, un nu vide plu kaphorus, ether and benzene; likevis in slouke, but not without alternation.

S. LYELVATETERLATE OF ETHYL. Calling 20° = Cao H³(C⁴H⁵), 250°. — So the later of the Ethyl crystylengerer. Naphtylechurefligsaures despited — Todings by the action of absolute alcohol on sulphate of the later of the sulphate. — The excess of alcohol is expelled a sulphate of the sulphate of the later of the la

res seed note story y leated it does not crystallise for a made 20. 20.

		Kimberle.
1. 3	144 . 61-01	. 60:77
14 B	12 5-09	5-19
£ \$	32 13 36	13.77
· · · _ ·	45 1 20/24	20-27
N 10 + 185	221 2.450	100 00

the second of the desired in with formation of sulphurous solution of the second of th

Carlo 180 - Ch2 - CEC - CAR' - 2 HO.50%

the said and section in the which and said homephthelate of points -

With pentachloride of phosphorus, it yields sulphite of chloronaphthalin, chloride of ethyl, and oxychloride of phosphorus.

It is insoluble in water, but mixes in all proportions with alcohol and

ether.

Naphthylthionamide. C²⁰H⁰NS²O⁴=C²⁰H⁷Ad,2SO². — Produced by the action of ammonia on sulphite of chloronaphthalin. The sulphite triturated in a basin with aqueous ammonia, becomes heated and melts to a yellow oil, solidifying in a light yellow amorphous mass, which may be purified by washing with water, solution in alcohol, and crystallisation. — It forms microscopic crystals apparently belonging to the right prismatic system, greyish yellow when dry, light yellow when moist, and becoming reddish by exposure to the air. In boiling water, it melts to a viscid mass, without decomposing. It is soluble in hydrochloric acid, ammonia, glacial acetic acid, alcohol and ether. Potash decomposes it into ammonia and sulphonaphthalic acid:

						Kim	berly.
20 C	***************	120	****	57.96	********	57.58	
9 H	***************************************	9		4.36		4.55	
							6.36
40	***************************************	32		15.46	*******	15.66	
C20 H	7Ad,2SO2	207		100-00		100.00	

May be regarded as
$$\binom{(S^2O^2)^n}{H^2}$$
 $N_{O^{2n}}$ deriving from the mixed type $\binom{H^8N}{H^2O^2}$

Argento-naphthylthionamide. C²⁰H⁸AgNS²O⁴=C²⁰AdH⁸Ag, SSO³.—A slightly ammoniacal alcoholic solution of naphthylthionamide is not precipitated by nitrate of silver, but as the ammonia evaporates in the air, argento-naphthylthionamide is deposited in small radiating needles, which alter by exposure to light. They are soluble in ammonia, alcohol, and ether, and likewise, without apparent alteration, in glacial acetic acid.—Contains 34·10 p. c. silver, the formula requiring 34·39 p. c.

Benzoyl-naphthylthionamide, C34H¹³NS²O⁶ = C²⁰AdH⁶(C¹⁴H⁵O²),2SO².

— Obtained by melting naphthylthionamide with chloride of benzoyl. It is soluble in alcohol and in glacial acetic acid, and crystallises from its solutions in prisms apparently belonging to the oblique prismatic system. Potash decomposes it, yielding ammonia, benzoate of potash and sulphonaphthylate of potash. — Contains 4·36 p. c. nitrogen and 10·41 sulphur (calculation = 4·50 p. c. N and 10·28 S).

Argento-benzoyl-naphthylthionamide. C²⁰AdH^bAg(C¹⁴H⁵O²),2SO². — The solution of the preceding compound in absolute alcohol forms, with ammonia and nitrate of silver, as the ammonia evaporates, an amorphous flocculent precipitate, sparingly soluble in alcohol and decomposed by boiling. By precipitating its ammoniacal alcoholic solution with a slight excess of acetic acid, and raising the temperature for a few seconds to 30° or 40°, the compound may be obtained in shining microscopic crystals. — Contains 24.94 p. c. silver and 7.75 sulphur (calculation = 25.83 p. c. Ag and 7.65 S). (Kimberly.)

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THE THE PRESENT OF THE PRESENT OF THE PROPERTY OF THE PROPERTY

The second of the SPH C-H-4ALH- \pm N. C-H = 0.00 and the dependence in which with the line has been superiors. It is seen to affect the object of the second of the which expectables in needles grouped errors a nearly than he in water, very soluble in alcohol—less of the error. The with difficulty: the alcoholic solution has a slicing main which solutions in drying.

Gridising properties of Oil of Turpeatine (comp. p. 256). — Berthelot has extended a contact with oil of turpentine which has been to the air. So cubic centimetres of oil of turpentine, rectified a few servously, were introduced into a 10-litre bottle, together with 50 grammes of the 100 cub, cent, of a standard solution of indigo requiring for decoderation of the chlorine = 23 cub, cent, oxygen). The whole was left to itself at 200 to 1.

eight months, the indigo-solution being added by portions of 50 vols. at a time. The quantities of oxygen absorbed by 1 vol. of the oil of turpentine were as follows:

In	7	days	**********	20	vols.	oxyg	en
"	16	13	***********	40		"	
.,	25	**	***********	60			
**	37	**	*********	80		"	9
,,	63	71	**********	102			
>>	77	27	**********	108		37	
**	160	23		135		31	
33	182	"	***********	146	12	11	
21	220	77	**********	168		22	

At the end of the time, the oil of turpentine was found to be completely resinised, and had lost all its characteristic properties. The quantity of oxygen absorbed by the indigo amounted to 12 times as much as would be sufficient for the complete combustion of the oil of turpentine, that is to say: 1 At. oil of turpentine, C²⁰H¹⁶, determines the absorption of 4.7 At. oxygen by the indigo. — The rate of absorption varied considerably during the experiment.

The oxidation of pyrogallate of potash by active oil of turpentine takes place immediately, attaining its extreme limit in a few seconds. — Mercury shaken up with active oil of turpentine is quickly killed; at the same time a black powder is formed, which appears to be the suboxide. — A solution of cane-sugar left for seven months in a large bottle, together with a small quantity of slaked lime, the whole being covered with a layer of oil of turpentine, yielded a considerable quantity of oxalic acid.

Oil of turpentine acquires the oxidising power when merely left to itself in a vessel containing air; sunshine accelerates the action, but is not necessary to it. The time required for the development of the oxidising power is not very long: for oil of turpentine cannot be absolutely deprived of it, unless very carefully excluded from the air.— Active oil of turpentine retains its power for several years, probably till it is completely resinised. The oxidating power may be destroyed by boiling or by agitation in a close vessel with deoxidising substances, such as indigo or pyrogallate of potash.—The oxygen absorbed by oil of turpentine may be partly displaced by a stream of carbonic acid; but the quantity thus displaced does not exceed the \(\frac{1}{100}\) pt. of that which is absorbable by indigo. The amount of this active oxygen is also much greater than that which is merely soluble in the oil of turpentine, amounting in fact to half the volume of the oil of turpentine, whereas the portion simply dissolved does not exceed one-fifth of the volume of the liquid.—From these phenomena, Berthelot concludes that the active oxygen of oil of turpentine is in a state of combination, similar to that of the transferable oxygen of peroxide of nitrogen. (N. Ann. Chim. Phys. 58, 426; Rep. Chim. pure. 2, 269.)

Volatile Oil of Citrus Lumia.

S. DE LUCA. Compt. rend. 51, 258; Rep. Chim. pure. 2, 462.

Obtained by expressing the rind of the fruit of Citrus Lumia, a plant which grows abundantly in Calabria and Sicily, and yields a fruit very much like the lemon. The greater part of the oil distils between 180°

and 190°, yielding a limpid colourless liquid.

The portion boiling at 180° is isomeric with oil of turpentine, and has a density of 0.853 at 18°. It possesses a dextro-rotatory power = 34° for the sensitive tint. It is slightly soluble in alcohol, very easily soluble in ether and in sulphide of carbon. It is resinised by nitric acid. — Mixed with alcohol and nitric acid, it produces after a while, a crystallised hydrate. With hydrochloric acid, it yields both a liquid and a crystalline compound. The crystallised compound, which has a peculiar odour and melts at a low temperature, is a bihydrochlorate C²⁰H¹⁶,2HCl.

Amber-camphor, C20H18O2.

BERTHELOT & BUIGNET. Compt. rend. 50, 606; Rep. Chim. pure, 189.

Obtained by distilling powdered amber with a fourth of its weight of potash and a large quantity of water; it then passes over with the vapour of water, a kilogramme of amber yielding 3 grammes of the camphor.—It resembles common camphor in its physical properties, excepting in having a more penetrating and persistent odour. It is isomeric with borneol (p. 332), but is distinguished therefrom by its smaller dextro-rotatory power which is only 4.5°, whereas that of natural borneol is 33.4°, and that of artificial borneol, prepared from common camphor by the action of alcoholic potash is 44.9°.

It unites with hydrochloric acid (with elimination of water), forming the compound, C²⁰H¹⁷Cl; similarly with stearic acid. The latter compound distilled with an alkaline hydrate, reproduces the amber-camphor with its original rotatory power and other physical properties. The camphor

probably exists in the amber in the form of a compound ether.

Oil of Cajeput.

MAX. SCHMIDL. Transactions of the Royal Society of Edinburgh, 22, 369; abstr. Proceedings of the same, 4, 326 (Session 1859-60).

This oil consists mainly of the bihydrate of a hydrocarbon (cajputene), isomeric with oil of turpentine. It has a green colour, even when purified by distillation from the copper-salts, which it generally contains (see page 335). Its specific gravity is 0.926 at 10°. On submitting it to fractional distillation, bihydrate of cajputene, which constitutes about two-thirds of the crude oil, passes over between 175° and 178°; smaller fractions, perhaps products of decomposition, are obtained from 178° to 240° and from 240° to 250°, and at 250° only a small residue is left, consisting of carbonaceous and resinous matter mixed with metallic copper. On treating this residue with ether, a green solution is obtained, which, when evaporated, leaves a green resin, soluble in the portion which boils between 175° and 178°, and capable of restoring its original colour.

CAJPUTENE. C²⁰H¹⁶. — Obtained, together with two isomeric hydrocarbons, (isocojputene and paracojputene) by cohobating bihydrate of cajputene with anhydrous phosphoric acid for half an hour, and then distilling off the liquid, whereupon cajputene passes over at 160°—165°, isocajputene at 176°—178°, and paracajputene at 310°—316°.

Cajputene is perfectly colourless, and has a very pleasant odoor resembling that of hyacinths. Sp. gr.=0.850 at 15°. Vapour-density

4.717.

				Se	hm	idl.	
	20 C 16 H						
1171	C20H16	136	100:00	 100-20		100-12	Ī

	Vol.	Density.
C-vapour H-gas		
Vapour of cajputene	2	

Cajputene is permanent in the air. - It is not affected by iodine at ordinary temperatures, but at a higher temperature, hydrogen is evolved and a black liquid is formed. — Bromine acts quickly on it, producing a dark viscid oil. — With gaseous hydrochloric acid, it forms a beautiful violet liquid, but no crystalline compound, even at —10°. — A mixture of ordinary nitric and sulphuric acids act upon it with violence, forming a yellow brittle resin.

Cajputene is insoluble in alcohol, but dissolves in ether and in oil of

turpentine.

Isocajputene C²⁰H¹⁶. — Obtained: (1.) as above. — (2.) By distilling the bihydrate of cajputene with oil of vitriol.

Oil boiling between 176° and 178°. Has an odour less agreeable than that of cajputene, and becoming more pungent and aromatic by exposure to the air, the oil at the same time acquiring a yellow colour. Sp. gr. = 0.857 at 16° . Vapour-density of (1) = 4.82; of (2) = 4.52.

				Schmidl.						
				Prepo	wed	by (1)		Prep	are	d by (2)
20 C 16 H										
C20H16	136	100.00	*******	99-80		99.86		99-95		100.06

Iodine, bromine, gaseous hydrochloric acid, and a mixture of nitric and sulphuric acids, act upon isocajpetene in the same manner as on cajputene. With oil of vitriol, and with dilute sulphuric hydrochloric or nitric acids (neither of which acts upon cajputene), it forms dark viscid liquids.

Isocajputene is insoluble in water and in alcohol, but mixes in all

proportions with ether and with oil of turpentine.

Paracajputene C40H32. - Obtained as above mentioned by distilling bihydrate of cajputene with anhydrous phosphoric acid; passes over between 310° and 316°. It is very viscous, has a lemon-yellow colour, and in certain directions exhibits deep-blue fluorescence. Vapourdensity 7.96.

40 C 240 32 H 32	Vol. C-Vapour 40 H-gas 32	16.6400
	Vapour 2	18-8576

The difference between the experimental and calculated vapour-densities is probably due to decomposition, taking place at the high temperature required for the determina-

Paracajputene oxidises rapidly in contact with the air, acquiring a red colour and resinous consistence. - A mixture of nitric and sulphuric acids does not act so violently on it as on cajputene and isocajputene. — With hydrochloric acid gas, it forms a dark viscid liquid which does not yield crystals, even at —10°.

Insoluble in water, alcohol and oil of turpentine; soluble in ether.

HYDRATES OF CAJPUTENE.—a. Mono-hydrate, C²⁰H¹⁸,HO.—Obtained by the action of oil of vitriol on oil of cajeput. When the crude oil is raised to the boiling point in a deep open vessel, and oil of vitriol continuously dropped into it, violent ebullition takes place, accompanied, after a while, by a peculiar crackling sound. As soon as this is observed, the flame must be lowered and the acid very cautiously added till the liquid suddenly assumes a dark colour, extending in an instant from the surface throughout the whole depth.—The vessel must then be immediately removed from the fire, otherwise further decomposition will take place, attended with evolution of sulphurous acid. The upper oily liquid is separated from the acid on which it floats, well washed, and distilled, and the portion which passes over from the 170° to 175° is collected and rectified.

Oily liquid, having a vapour-density of 5.19 to 5.27.

			Schmidl.	1	701.		Density.
20 C 17 H O	17	 11.72	 11.77	C-vapour H-gas O-gas	17	******	1.1781
C20H17O	145	 100.00	 100.00	Vapour			10:0529

The vapour-density is anomalous, inasmuch as the molecule C²⁰H¹⁷O, which occupies two volumes of vapour, contains but 1 At. oxygen. Probably the true formula of the body is C⁴⁰H³⁰O² = C⁴⁰H³² + H²O², this molecule splitting up at high temperatures into C⁴⁰H³² and H²O², each of which occupies two volumes of vapour, and consequently the two together occupy 4 volumes (compare xiii, 487.)

b. Bihydrate. C²⁰H¹⁸O² = C²⁰H¹⁶, 2HO. This is the chief constituent of oil of cajeput (p. 510), and passes over in the fractional distillation between 175° and 178°. After rectification, it is a colourless oil which boils constantly at 175°, has a specific gravity of 0.903 at 17°, and vapour-density = 5.43.

					Schmidl.		Vol.	Density.
20 C	120	****	77.92	********	77.84	C-vapour	20	8:3200
18 H	18		11.68		11.91	H-gas	18	1-2465
20	16	-44	10.40	*****	10.25	O-gas	1	1-1093
C20H18O2	154	***	100.00		100.00	Vapour	2	10-6758
							1	5-8379

Decompositions. 1. Exposed to the air for a considerable time in the moist state, it changes to a reddish liquid which ultimately exhibits a rather strong acid reaction with litmus. — 2. Iodine dissolves in the oil, and under certain circumstances forms crystalline compounds (p. 515). — 3. Bromine acts quickly upon it, and forms crystalline compounds under similar circumstances (p. 514). — 4. Chlorine gas passed into the oil raises the temperature, but does not appear to act upon it further; but nascent chlorine (evolved by passing hydrochloric acid gas into the oil mixed with dilute nitric acid) converts it into bichloride of capputene $C^{20}H^{10}Cl^2$. — 5. Anhydrous phosphoric acid heated with the bihydrate,

takes away the whole of its water, converting it into cajputene, isocajputene and paracajputene (p. 511). — 6. Chloride of zinc likewise dehydrates it, but less completely. — 7. Oil of vitriol acts but very slowly on the oil at low temperatures; but if the temperature be allowed to rise, sulphurous acid is given off, and the oil blackens and ultimately suffers complete decomposition. If the action be checked at a certain point, a sulpho-acid is formed, which yields a soluble baryta-salt. Oil of vitriol dropped into the oil at the boiling heat, in the manner described at page 512, takes away half the water, forming monohydrate of cajputene. - Dilute sulphuric acid on the contrary causes the bihydrate to take up 4 At. more water, converting it into C20H16+6HO. - Fuming oil of vitriol converts the bihydrate into a thick brown liquid, which boils above 360°. — 8. Fuming nitric acid rapidly oxidises the oil, even at ordinary temperatures, forming a large quantity of oxalic acid. nary nitric acid produces the same effect at the boiling heat, but at ordinary temperatures, it acts very slowly, converting the oil into a red liquid.—9. Distilled over permanganate or bichromate of potash in presence of sulphuric acid, it forms a thick resinous liquid.—10. It does not appear to be altered by digestion with peroxide of lead. -11. In contact with aqueous potash, or when dropped into melting potash, it forms a soluble salt, the acid of which is precipitated as a resin by hydrochloric or sulphuric acid. - 12. Heated with sodium, it forms a crystalline mass, soluble in water and alcohol, and consisting of soda and an organic substance, which is separated by strong acids in the form of a fragrant resin.

— 13. When the vapour of the bihydrate is passed over red-hot sodalime, a yellow oil distils over, having a peculiar odour quite different from that of the bihydrate, and at the same time the soda-lime becomes blackened by deposited charcoal, and when treated with acids, gives off a large quantity of carbonic acid. The yellow oil thus formed yielded by distillation a fraction boiling between 180° and 185°, which gave in two analyses, 79.76 and 80°03 p. c. C, 12°20 and 12°07 H, agreeing nearly with the formula C26H24O26 which requires 79°59 p. c. C, 12°44 H, and 7°97 O.

Combinations. Bihydrate of cajputene dissolves in all proportions in

alcohol, ether, and oil of turpentine.

c. Hexhydrate, C20H22O6 = C20H18,6HO. - Produced by the action of dilute sulphuric acid on the bibydrate, or on crude oil of cajeput. - Two pts. of dilute sulphuric acid are added to 1 pt. of the crude oil; and the mixture is well shaken for several days till the watery layer acquires a yellowish colour, and then left to itself for about ten days, whereupon it deposits crystalline tufts of the hexbydrate, adhering to the sides of the vessel.

The crystals melt at 120°, and solidify again at 85°. On submitting them to dry distillation, an oily liquid passes over and condenses again in the colder parts of the apparatus, apparently as the unaltered hexhydrate. The crystals dissolve sparingly in cold, easily in boiling

alcohol :

|--|

514 ADDENDA TO COMPOUNDS CONTAINING 20 AT. CARBON.

Crystals having the same composition were deposited from a secondary fraction of crude reject-the which distilled at 210° — 230°, and was left for a very long time moter and entry sell to the air. The crude oil mixed with nitric acid and alcohol changes, in the course of seven or eight months, into a black heavy liquid in which crystals are suspended, perhaps consisting of the hexaydrate. The same compound appears likewise to be formed in beautiful long prisms, when the crystalline mass produced by passing hydrochloric acid gas into rectified oil of cajeput is thrown into water at alcohol.

CHLORIDE OF CAPPUTENE. C*** H¹**Cl²*. — Produced by the action of nascent chlorine on the bihydrate. When the portion of cajeput-sil, distilling between 175° and 178°, is mixed with very dilute nitric acid, and hydrochloric acid gas is passed into the liquid, a violent action takes place in a few minutes, vellow and red fumes of chlorine and nitrous gas being evolved, and if the passage of the gas be continued, chloride of cajputene ultimately sinks to the bottom, as a limpid brown oil, which may be freed from adhering nitric and nitrous acid by distillation over strong potash-ley. It has a fragrant odour, and may be kept for any length of time without alteration, but is decomposed by distillation. Boiled with nitrate of silver, it detonates in a peculiar manner and form chloride of silver.

		į	Schmidl.
			mean.
20 C	120	57.97	57:45
16 H	16	7.73	8-09
2 Ci	71	34.30	34.39
C»H:«Cl:	207	100.00	99-93

Crystals were once obtained by keeping the oil at a low temperature, but ast a sufficient quantity for analysis.

Monohydrochlorate of Cajputene. C²⁰H¹⁶, HCl. — Obtained is distilling the bihydrochlorate, and collecting apart the fraction which boils at 160°:

				1	Schmidl.
					mean.
20 C	120.0	.	69.76		69.70
17 H	17.0		9.88	•••••	10.00
C1	35.2	•	20.36		20.23
C»Hr;Cl	172.5		100.00		100.23

A product having the same composition is obtained by treating the bihydrochlers: for several days with aqueous or alcoholic potash; but its odour is different from of the product obtained by simple distillation of the hydrochlorate, and resembles 2st of pelargonic other.

BIHYDROCHLORATE OF CAJPUTENE. C²⁰H¹⁶, 2HCl. — Obtained by passing hydrochloric acid gas through rectified cajeput-oil, mixed with a third of its volume of alcohol or strong aqueous hydrochloric acid Crystallises from alcohol in beautiful radiating tufts. Melts at 55°, 224 solidities again at 30°. It has no taste or smell. — By dry distillates it gives off hydrochloric gas at 60°, and splits into several fractions. **Of which is the monohydrochlorate. — It is also deprived of half a chlorine by heating with aqueous or alcoholic potash. It dissove sparingly in cold, easily in boiling alcohol or ether.

			Schmidl.
			mean.
20 C	120	57.41	57.57
18 H	18	8.61	8.94
2 Cl			
C100 LT18/C119	001	100.00	101:00

When hydrochloric acid gas is passed through rectified oil of cajeput, kept at a low temperature, a violet liquid is formed which in 10 or 15 minutes solidities in a crystalline mass. This crystalline compound is extremely deliquescent, liquefying rapidly even when pressed between blotting paper cooled to -25°: the resulting liquid rapidly gives off fumes of hydrochloric acid, and is completely decomposed by distillation. If the crystalline mass, immediately after its formation, be thrown into water or alcohol, beautiful long prisms are formed, after a few days, apparently consisting of hexhydrate of cajputene (p. 513).

Browide of Cajputene. C²⁰H¹⁶Br⁴. — Obtained by the action of bromine on oil of cajput. When dry bromine is dropped into the rectified oil, a very brisk action takes place, and the sides of the vessel become covered with yellow needles, which however soon disappear; but if the addition of the bromide be continued till the reaction almost ceases, a dark, thick, viscous oil is formed, which, after several weeks, deposits a granular substance. By boiling the mixture with alcohol, the granular substance is extracted; a heavy oil is left behind; and the alcoholic solution, on cooling, deposits bromide of cajputene as a soft crystalline substance, having a fatty lustre and much resembling cholesterin.

Bromide of cajputene melts at 60°, and solidifies again at 32°. By dry distillation, it yields a liquid which crystallises again in the cooler parts of the retort. It is not altered by boiling with aqueous potash. It dissolves in ether and in boiling alcohol.

Rectified oil of cajeput shaken up with bromine-water forms a red resin, from which a solid substance separates in small white prisms extremely deliquescent and rapidly decomposing

rapidly decomposing.

Another crystallised bromine-compound (probably a hydrobromate analogous to the hydriodate), is formed in the same manner as that compound (vid. inf.), dissolved in bisulphide of carbon.

HYDRIODATE OF CAJPUTENE.—a. Anhydrous, C²⁰H¹⁶, HI.—Obtained by adding a solution of phosphorus in bisulphide of carbon to a solution of iodine and oil of cajeput in the same liquid. Brisk action then takes place, the vessel becoming very hot; red oxide of phosphorus is precipitated; and the oily liquid becomes reddish, giving off vapours probably containing phosphuretted hydrogen, and if left to itself for 10 or 12 days, deposits crystals of the hydriodate. The reaction probably takes place as represented by the equation:

The crystals of the hydriodate are deposited in cells like those of beehives, and possess a black metallic lustre. They are soluble in alcohol and in ether, and are very stable, not being altered, even by boiling with potash:

			Schmidl.
			45·29 45·36 6·31 6·35
I	127	48·12	48.85
C ²⁰ H ¹⁷ I	264	100.00	

b. Hydrated, C²⁰H¹⁸IO = C²⁰H¹⁸,HI + HO. — When iodine is added in small quantities to cajeput-oil, crude or rectified, at ordinary temperatures no visible action takes place (if external heat be applied, the action goes too far and nothing but a viscous mass is produced which does not crystallise); but on stirring rather constantly, the action is assisted, partly by the heat resulting from the friction of the glass rod, partly by the mechanical distribution of the iodine, and the temperature of the liquid soon rises from 10° to 40°. The addition of iodine must then be discontinued, and the vessel immersed in cold water. A black crystalline compound then separates after a short time; and on separating this substance from the oily liquid by filtration, pressing it between blotting paper, and when it is nearly dry, dissolving it in alcohol or ether, a solution is obtained, from which the hydrated hydriodate crystallises in prisms having a fine yellow-green colour and metallic lustre. They are very deliquescent, and melt at 80° into a liquid which does not recrystallise in the cold. Potash-ley liquefies the compound, abstracting part of the iodine, and with the aid of heat abstracts the whole.

				mean.	
20 C	120		43.95	 43.11	
18 H	18	••••	6.50	 6.90	
I	127		46.52	 46.51	
O	8	••••	2.04	 3.48	
C20H18IO	273		59.01	 100.00	

Regarded by Schmidl as hydriodate of monohydrate of cajputene = C20H17O, III.

It is insoluble in water, and is not decomposed thereby; very soluble in alcohol and ether.

COMPOUNDS CONTAINING 22 AT. CARBON.

Primary Nucleus CnH10: Oxygen-nucleus CnH406.

Graphitic Acid.

 $C^{22}H^4O^{10} = C^{22}H^4O^4, O^4$

B. C. Brodie. Ann. Pharm. 114, 6.

Formation. By the repeated action of chlorate of potash and nitric

acid on graphite.

Preparation. Graphite carefully purified by boiling with acids and fusion with hydrate of potash in a silver crucible, is intimately mixed with 3 At. chlorate of potash; the strongest nitric acid is added in sufficient quantity to render the mixture fluid; and the whole is either exposed to sunshine or heated on the water-bath to 60° for three or four days. If at the end of this time, no more yellow vapours are evolved, the mixture is to be shaken out into a large quantity of water, the undissolved portion completely washed by decantation, then dried on the water-bath, and again brought in contact with the same quantities of nitric acid and chlorate of potash, and the same treatment is to be repeated four times or as often as any further alteration of the substance appears to be produced.

—Graphite cannot be completely converted into graphitic acid by one warming with chlorate of potash and nitric acid, even for a long time. — Graphitic acid obtained as above contains about ½ p. c. ash, probably derived from the glass vessels.

Properties. Perfectly transparent, thin crystals, belonging either to right or the oblique prismatic system.

			Bro	die.
At 100	or in v	acuo.	a.	b.
22 C	132	61.11	60.74	. 61.04
4 H				
10 O	80	37.01	37.41	. 37.11
C22H4O10	216	100:00	100:00	. 100:00

a, mean of eight analyses; b, mean of the same analyses after deducting $\frac{1}{2}$ p. c. ash. The formula should perhaps be doubled, inasmuch as Brodie, from the analysis of the baryta-salt, is inclined to regard the acid as bibasic.

Decompositions. 1. The acid decomposes when heated, with explosion, incandescence, and evolution of gas, and leaves a black finely divided residue. — When graphitic acid is suspended in Rangoon naphtha.

(rectified over sodium and boiling at 270°) and heated, a large quantity of water distils over between 100° and 200°, whilst at first a small and afterwards a larger quantity of carbonic acid oscapes, the naphtha acquires a deep red colour, and a black residue is left having the appearance of charcoal. This residue, collected after 3—4 hour heating of the graphitic acid with the naphtha to 250°, weighed 66°77 to 66°98 p. c., but still contained traces of transparent crystals; after 14 hours heating, it weighed 65°77 p. c., and had then the composition C^MH²O³.— Brodie gives the following decomposition-formula as probable:

$$7 \text{ C}^{22}\text{H}^4\text{O}^{10} = 3 \text{ C}^{44}\text{H}^2\text{O}^8 + 12 \text{ HO} + 12 \text{ CO}^2 + 10 \text{ CO}.$$

(But this equation gives no account of the disappearance of 10 At. H; Kr.) The formation of 3 At. C⁴⁴H²O⁵ from 7 At. C²²H⁴O¹⁶, should give a residue of 65.48 per cent.

The black residue obtained by heating graphitic acid with Rangoon naphths, after being washed with ether and alcohol, contains on the average 80·13 p. c. C, 0·38 H, and 19·29 O (after heating for a short time, it is comparatively poor in carbon, but becomes richer after longer heating). Calculation 80·00 p. c. C, 0·60 H, and 19·40 O. The residue obtained by heating graphitic acid per se, contained 80·36 p. c. C, 0·71 H, and 18·93 O. Heated for some time to 250° in nitrogen gas, it gives of 2:25 w 2·30 p. c. water and traces of carbonic oxide, leaving a residue amounting to 97·16—97·38 p. c. The latter residue contains, on the average, 81·82 p. c. C, 0·44 H, and 17·74 p. c. O: it is therefore C¹²⁸H⁴O²⁸ (calculation 81·48 p. c. C, 0·41 H, and 18·41 O), and is formed as shown by the equation 3 C¹⁴H²O⁸ — C¹²⁸H⁴O²⁸ + 2 HO.—If it be again strongly heated, carbonic acid and carbonic oxide are evolved; but our after several hours exposure to a red heat, it still retains hydrogen and exygen.

2. When hydrosulphate of ammonia or sulphide of po!assism is pourd upon graphitic acid, it decomposes with decrepitation, forming a graphitoidal substance having the metallic lustre.

3. It is decomposed in like manner by boiling with acid solutions of cuprous or stannous chloride.

Combinations. Graphitic acid is somewhat soluble in pure water, not in water containing acids or salts.

It unites with alkalis. Shaken up with aqueous ammonia, it is transformed into a transparent jelly, without dissolving, and on addition of acids, is precipitated as a jelly, like silicic acid, which after drying is vacuo, has the same weight as the graphitic acid originally employed.

Graphitate of Baryta. — Moist graphitic acid, shaken up with baryta-water, washed and dried at 100°, yielded a compound which contained 21·19 p. c. Ba, and after being suspended in water and decomposed by a stream of carbonic acid, still contained at 100°, 13·30 p. c. Ba. Hence Brodie regards the former salt as essentially containing C²²H³BaO²⁰ (calculation 24·13 p. c. Ba), and the latter as C⁴⁴H⁷BaO²⁰ (calculation 13·73 p. c. Ba), and graphitic acid probably as bihasic. — The baryta-salts are hygroscopic and detonate with violence when heated. (Brodie.)

Azo-nucleus C22NHº.

Cryptidine.

 $C^{23}NH^{11} = C^{23}NH^{9},H^{2}.$

GR. WILLIAMS. Trans. Roy. Soc. Edinb. 21, Pt. iii. 377; Chem. Gaz. 1856, 261 and 283; abstr. 69, 355; Lieb. Kopp. Jahresber. 1856, 537.

Known only as a platinum-salt.

Found, together with many other products, in coal-tar, and obtained in the preparation of chinoline (xiii, 243) among the products boiling at about 274°. As however these products still contain chinoline and lepidine (xiv, 103), from which the cryptidine, on account of its small quantity, cannot be completely separated by fractional distillation, the hydrochloric acid solution of the portion which distils at 274° is mixed with bichloride of platinum; and the platinum-salt, which precipitates as a yellow pasty mass, soon becoming crystalline, is recrystallised from boiling water, and washed with ether alcohol; — or the portion distilled between 270° and 274° is treated with nitric acid, whereby an insoluble powder is separated, and this is converted into a platinum-salt.

Platinum-salt.			1	Williams. mean.
22 C	132.0	36.31		35.89
N	14.0	3.85		
12 H	12.0	3.30	•••••	3.37
Pt	99.0	27.24	****	27.17
3 Cl	106.5	29.30		
C2NH11,HCl,PtCl2	363.5	100.00		

Cryptidine is isomeric with ethyl-chinoline and methyl-lepidine.

Primary Nucleus C22H14: Oxygen-nucleus C22H5O6.

Limettic Acid.

 $C^{22}H^6O^{12} = C^{22}H^6O^6, O^6.$

H. Vohl. N. Br. Arch. 74, 16; abstr. Pharm. Centr. 1853, 318.

Formation. Produced, together with formic and acetic acids, by the action of bichromate of potash and sulphuric acid on oil of lime (p. 304), and oil of rosemary (p. 396).

Preparation. Oil of lime is added by small portions to a mixture of bichromate of potash and sulphuric acid; and the portion of the oil which is volatilised in consequence of the great heat developed, is collected and poured back. As soon as the action is finished, the liquid is diluted with water, and the limettic acid which separates as a resin is washed, and purified by repeated solution in aqueous carbonate of potash, precipitation with nitric acid, and recrystallisation from alcohol.

Properties. White, crystalline. Volatilises when heated, and forms a crystalline deposit on cold bodies. It has neither taste nor smell.

							Vob	
	At 100%					a.	mea	R. В.
22 C	***************************************	132	••••	55.93	•••••	55.79	••••	55:97
8 H		8	••••	3.39		3.46	••••	3.43
12 O	•••••	96		40.86		40.75		40.60

a, from oil of lime; b, from oil of rosemary. According to Vohl, it is monobasic and = C11H4O6.

Limettic acid is sparingly soluble in water.

Limettate of Silver. - Obtained by adding nitrate of silver to the acid neutralised with ammonia. Powder sparingly soluble in water, and blackening on exposure to light. Contains 51.44 p. c. oxide of silver (C²²H⁶Ag²O¹²=51.56 p. c. AgO.)

Limettic acid dissolves readily in alcohol.

Oxygen-nucleus C22H10O1.

Rottlerin.

 $C^{22}H^{10}O^6 = C^{22}H^{10}O^4,O^2.$

Anderson. Edinb. New Phil. J. (new series) 1, 300; abstr. Pharm. Centr. 1855, 372; Lieb. Kopp. 1855, 669.

The stellate hairs and glands which cover the fruit of Rottleria tinctoria, and are used in the East Indies as a dye, contain rottlerin, together with a flocculent substance, $C^{40}H^{34}O^8$, and a resinous colouring matter, $C^{40}H^{30}O^{14}$.

Preparation. The colouring matter is exhausted with ether, and the greater part of the other distilled off, the rottlerin then crystallising from the residue.

Properties. Yellow, silky crystals.

			Anderson.
22 C	132	69.47	(9-11
10 H	10	5.26	5·55
6 O	48 2	25.27	25:34
Cz;IIIuOe """	130 10	00.00	100.00

Melts when heated, giving off pungent vapours and leaving charcoal. By bromine, it is quickly decolorised, with formation of a non-crystallisable substitution-product. - With cold oil of vitriol, it forms a yellow solution, but hot oil of vitriol chars it, giving off sulphurous acid. -Nitric acid first converts it into a yellow resin, and then decolorises it.

It is soluble in water, and with red colour in alkalis. Its alcoholic solution is not precipitated by neutral acetate of lead.

It is slightly soluble in cold alcohol, more soluble in boiling alcohol, easily soluble in ether.

Primary Nucleus C22H16: Oxygen-nucleus C22H12O4.

Sinapic Acid.

$C^{22}H^{12}O^{10} = C^{22}H^{12}O^4.0^6.$

BABO & HIRSCHBRUNN. (1852.) Ann. Pharm. 84, 19; abstr. Pharm. Centr. 1852, 916; J. pr. Chem. 58, 283; N. Ann. Chim. Phys. 38, 108; N. J. Pharm. 33, 293; Chem. Gaz. 1853, 81. v. Babo & Hirschbrunn.

Formation. Hydrosulphocyanate of sinapine is resolved by boiling with potash or baryta-water into sulphocyanide of barium, sincaline, and sinapate of baryta:

$$C^{12}NH^{13}O^{10},C^{2}NHS^{2} + 3 BaO = C^{2}NBaS^{2} + C^{22}H^{10}O^{8},2BaO + C^{10}H^{13}NO^{2},HO.$$

By exhausting aqueous mustard-paste with ether, distilling off the ether, and treating the residual acrid extract with cold water, Simon (Pogg. 44, 601) obtained his Senfacure, which is perhaps identical with Babo's sinapic acid. It remains behind when the aqueous solution is cautiously evaporated (if too much heat is applied, sulphurous acid escapes), and may be freed from soft resin by washing with ether and crystallised from alcohol. It does not colour alkalis yellow, but reddens ferric salts, like hydrosulphocyanic acid; it dissolves easily in alcohol, slowly in ether, and is not easily converted into hydrosulphocyanate of sinapine. (Simon.)

Preparation. Hydrosulphocyanate of sinapine is boiled with potashley; the liquid is supersaturated with hydrochloric acid; and the resulting precipitate is purified by recrystallisation from boiling alcohol of 60 p. c. If the solution be left for some time exposed to the air, it becomes red-brown and suffers partial decomposition, but the unaltered portion may be recovered by treatment with animal charcoal. — The acid is obtained as an insoluble baryta-salt, in the preparation of sincaline by boiling hydrosulphocyanate of sinapine with baryta-water.

Properties. Small prisms which melt between 150° and 200°, and solidify in the crystalline form.

<i>At</i> 110°.		v. Babo &	Hirschbrunn	l.
22 C	132	58.93	58.67	58 92
12 H	12	5.33	4.87	5.67
10 O	08	35.72	36.46	35.41
C22H12O10	224	100.00	100.00	100.00

Decompositions. 1. When heated above its melting point, it gives off a colourless oil, and leaves a brown residue, which turns red after some hours, and chars at a low red heat. Ammonia-gas produces from the oil and the residue, crystalline yellow substances, which dissolve with difficulty in water, and scarcely turn red. — 2. The acid neutralised with potash or soda turns red on exposure to the air, then brown. The other sinapates likewise alter quickly (see below). — 3. By chlorine-water, especially when warm, it is coloured rose-red and then purple-red, but not dissolved. — 4. It dissolves in nitric acid with red colour changing to orange-yellow, apparently with formation of oxalic acid and a nitro-compound. — In the form of potash-salt, it immediately reduces gold from the terchloride.

Combinations. Sinapic acid dissolves very slowly in cold, somewhat more readily in hot water. — It unites with bases, forming salts, among which those of the alkalis are easily soluble and crystallisable, while the

rest are difficultly soluble.

Sinapate of potash forms white precipitates with chloride of calcium and with solution of alum; the latter precipitate treated with chlorine-water, assumes first a rose-red and then a dirty red colour. With sesquichloride of iron, it forms a rose-red or sometimes a purple-red precipitate, with formation of ferrous oxide. — From solution of copper and lead-salts, it throws down precipitates which soon turn blue-green; with mercuric and silver salts, white precipitates which decompose, with separation of metal, especially on addition of more alkali.

Sinapute of Potash. — Precipitated from the aqueous solution by absolute alcohol, in iridescent laminæ, which soon change after the alcohol has been poured off.

Sinapate of Baryta. — (Vid. p. 520.) Sinapic acid is boiled with excess of baryta-water out of contact with the air, and the precipitate is washed with water free from carbonic acid.

			Y	- Babo	& Hirschbrunn.
22 C	132	****	36.80	*******	
10 H	10		2.78	amme	2.90
80	64	****	17.82		18.12
2 BaO					
C22H10O8,2BaO	359		100.00		100.00

Sinapic acid is sparingly soluble in cold, easily in hot alcohol, insoluble in ether.

Interpolation: Sincaline.

$C^{10}NH^{13}O^2 = C^{10}NH^{11}O^2, H^2.$

v. Babo & Hirschbrunn. Ann. Pharm. 84, 22.

Formation. By boiling hydrosulphocyanate of sinapine with barytawater or potash-ley (p. 520).

Preparation. Hydrosulphocyanate of sinapine is heated with baryta-water till the sinapate of baryta is completely separated; the filtrate mixed with a slight excess of dilute sulpharic acid, is freed from hydrosulphocyanic acid by precipitation with aqueous sulphate of iron or copper; the liquid is filtered from the precipitated sulphocyanide of copper; the filtrate precipitated with baryta-water; carbonic acid passed through it; and the solution filtered from the carbonate of baryta is evaporated on the water-bath: carbonate of sincaline then remains behind. By neutralising the carbonate with aqueous hydrochloric acid, digesting the hydrochlorate with oxide of silver, and evaporating the solution filtered from the chloride of silver and excess of oxide, in vacuo or on the water-bath, sincaline is obtained as a colourless crystalline mass.

Sincaline, according to v. Babo, is C10NH14O2; the formula here adopted, which is that proposed by Gerhardt, contains 1 At. hydrogen less.

Sincaline chars when heated, giving off an odour of methylamine and a combustible vapour.

Combinations. Sincaline exposed to moist air, deliquesces and becomes heated. — It dissolves sulphur, with formation of (penta?) sulphide and sulphate of sincaline, and on adding an acid to the solutions, sulphuretted bydrogen is evolved and milk of sulphur is precipitated.

Sincaline is a strong base. Its aqueous solution acts upon metallic salts like potash, precipitating the oxides, even from the salts of baryta, lime and mercuric oxide. The precipitates formed in solutions of alumina and chromic salts dissolve in excess of sincaline, the chromic precipitate being reprecipitated on boiling. — The sulphate, hydrochlorate and nitrate of sincaline are deliquescent.

Carbonate of Sincaline. — Aqueous sincaline absorbs carbonic acid from the air, and forms a deliquescent salt.

Chloro-aurate of Sincaline is precipitated as a yellow crystalline powder, on adding terchloride of gold to aqueous hydrochlorate of sincaline, and may be obtained in plumose crystalline needles and laminæ by washing with cold and recrystallising from boiling water.

At 110°.		v. Babo & Hirschbrunn.
10 C	60.0	13.55 13.63
14 H	14.0	3.16 3.38
N	14.0	3:16
20		3.61
Au		44.42 44.54
4 Cl	142.0	32.10
01011123102 1101 1-013	410.0	100-00

C10H13NO2,HCl,AuCl3 442.6 100.00

So according to Gerhardt (Traité, 2, 431); according to v. Babo & Hirschbrunn, it is C¹⁰H¹⁴NO², HCl, AuCl³.

Chloroplatinate of Sincaline. - Crystallises on mixing hydrochlorate of sincaline with bichloride of platinum and evaporating, in splendid orange-coloured prisms; by slow evaporation, it is obtained in six-sided plates half an inch in diameter. — At 110°, it gives off 5.32 p. c. water (by calculation, 2 At. = 5.50 p. c. Aq).

			v.	Babo	& Hirschbrunn.
10 C	60.0	***	19.40		19.65
14 H	14.0	****	4.53		5.13
N					
2 0					
Pt				*******	31.30
3 Cl	106.5		34.44		
C10H18NO2, HCl, PtCl2	309.2		100-00		

Conjugated Compounds of Sinapic Acid.

Sinapine.

C32H23NO10.

O. HENRY & GAROT. J. Pharm. 17, 1. - further, 20, 63. Pelouze. Ann. Chim. Phys. 44, 214; Pogg. 20, 358; N. Tr. 23, 2, 253; Schw. 60, 468; J. Chim. méd. 6, 577; further, J. Pharm. 17, 271; Schw. 63, 93.

BOUTRON & ROBIQUET. J. Pharm. 17, 279.

FAURÉ. J. Pharm. 17, 279.

O. HENRY & H. PLISSON. Ann. Chim. Phys. 46, 198.

Winckler. Repert. 41, 169; further, 67, 257. Simon. Pogg. 43, 651; further, 44, 593. Boutron & Fremy. J. Pharm. 26, 50.

Y. BABO & HIRSCHBRUNN. Ann. Pharm. 84, 10; abstr. Pharm. Centr. 1852, 916; J. pr. Chem. 58, 283; N. Ann. Chim. Phys. 38, 108; N. J. Pharm. 23, 294; Chem. Gaz. 1853, 81.

O. Henry & Garot described, in 1825, a peculiar sulphuretted acid of white mustard, Acide sulphosinapique, which they extracted from the fixed oil. These experiments however partly relate to hydrosulphocyanic acid, which was obtained from white mustard at the same time by Hornemann (Berl. Jahrb. 29, 1, 29), and afterwards by Pelouze, according to the process given by Henry & Garot. Pelouze likewise pointed out certain discrepancies in the statements of Henry & Garot, who thereupon discovered hydrosulphocyanate of sinapine. Von Babo & Hirschbrunn, starting apparently from some observations of Will (Ann. Pharm. 65, 213), first recognised the true nature of this body, and studied its products of decomposition. — Hydrosulphocyanate of sinapine is synonymous with the sulphosinapisine, or sinapine of Henry & Garot, the sulphosinapisine of Boutron & Fremy, the sulphosinespine of Boutron & Robiquet and of Winckler, the sulphocyanide of sinapine (Schwefeleyansinapin) of v. Babo, and exhibits certain reactions in common with the (not isolated) acid of mustard (Senjsäure) of older authors. — Different from this is the sinapisine of Simon (Pogg. 43, 652), a solid fatty acid from black mustard (Pogg. 50, 379). O. Henry & Garot described, in 1825, a peculiar sulphuretted acid of white mus-Simon (Pogg. 43, 652), a solid fatty acid from black mustard (Pogg. 50, 379).

Source. In white mustard, the seed of Sinapis alba, as hydrosulpho-cyanate of sinapine (v. Babo & Hirschbrann). Also in the seed of Turrilis glabra and Sinapis nigra. (Henry & Garot, Fanré.)

SINAPINE. 525

Known only in aqueous solution and in combination with ācids.

Preparation of Hydrosulphocyanate of Sinapine. 1. Dry mustard powder, exhausted with ether and thereby freed from fixed oil, is treated with cold absolute alcohol as long as the alcohol acquires a reddishyellow colour, whereby a small quantity of sinapine is taken up, to be recovered as described further on; the residue is boiled with alcohol of 90 p.c., then pressed, and the boiling and pressing are repeated twice more. The hot-filtered tinctures yield, after half the alcohol has been distilled off, colourless crystals of hydrosulphocyanate of sinapine, an additional quantity of which may be obtained from the mother-liquors by further evaporation and addition of sulphocyanide of potassium. Sulphocyanide of potassium likewise precipitates hydrosulphocyanate of sinapine from the above-men-

tioned extracts prepared with cold alcohol.

2. Mustard-flour, freed from fixed oil by pressure in the oil-mill, is exhausted with cold and then with hot alcohol of 80 p. c.; about \(\frac{3}{4} \) of the alcohol is distilled from the united tinctures in the salt-bath, or so much, that a sample of the residue separates on cooling into two equal layers consisting of oil and aqueous hydrosulphocyanate of sinapine. If the concentration is carried too far, the hydrosulphocyanate of sinapine no longer crystallises; and, on the other hand, if a sufficient quantity of the alcohol be not distilled off, part of the sinapine remains dissolved in the alcoholic oily layer, and is somewhat difficult to obtain in the form of crystallised hydrosulphocyanate: the best way of effecting this is to add a small quantity of alcoholic sulphocyanide of potassium.—The upper layer is removed, and the lower watery liquid is either left to itself for a week or as long as hydrosulphocyanate of sinapine continues to crystallise from it; and the crystals are collected on linen, separated from the viscid mother-liquor by means of a centrifugal machine; moistened with alcohol; strongly pressed between filtering paper, and recrystallised from alcohol of 90 p. c., then from a small quantity of boiling water, with addition of animal charcoal;—or better, the lower watery layer is mixed with alcoholic sulphocyanide of potassium, and the crystals which separate are purified as above. The mother-liquors also yield an additional quantity of hydrosulphocyanate of sinapine on addition of sulphocyanide of potassium. (v. Babo & Hirschbrunn.)

3. Bruised white mustard-seed, freed from the greater part of the

3. Bruised white mustard-seed, freed from the greater part of the fixed oil by pressure at 50°, is exhausted with ether; the residue is digested with 7 pts. of alcohol of 80 p.c., then with 2 pts. more; the alcohol is distilled off from the tinctures till the residue is reduced to one-fourth of the weight of mustard-powder used; this residue is set aside for 14 days to crystallise; and the crystals, after being freed by ether from a red-brown matter, are purified by repeated crystallisation from water and alcohol, with addition of animal charcoal. (Winckler.)

Winckler also digests white mustard with 3 pts. of alcohol of 80 p.c., evaporates the tincture to \(\frac{1}{8} \) of the weight of mustard used; treats the residue, which is covered with oil drops, with ether, as long as the ether is thereby coloured; and purifies the residual hydrosulphocyanate of sinapine by solution in water and recrystallisation as above. — A similar process is adopted by Simon, who, however, at each extraction of the mustard-flour, uses only enough alcohol to moisten the mustard-flour, and subjects the whole to strong pressure: by this treatment, the exhaustion is effected more quickly than when a larger quantity of alcohol is used.

Older Methods. O. Henry & Garot boil mustard-flour for a few seconds with water; strain the liquid through cloth; press the residue:

evaporate the decoction to the consistence of honey; and shake it up with 6 to 8 vol. alcohol of 40°. The alcoholic tincture freed from alcohol by distillation is set aside to crystallise; and the crystals are purified by pressure, recrystallisation from alcohol, washing with other (to remove a volatile red substance), and another crystallisation from alcohol. The mother-liquors become acid, in consequence of the continual liberation of hydrosulphocyanic acid. — This process does not easily yield hydrosulphocyanate of sinapine in the crystalline state. (v. Babo & Hirschbrunn.) — Fauré evaporates the decoction of black mustard, boils the extract with alcohol, evaporates to the consistence of honey, and dilutes with water, whereupon hydrosulphocyanate of sinapin is precipitated. This product is purified as above. Or he first exhausts black mustard with hot ether, then boils it with alcohol, and suspends the alcoholic extract in water, whereupon the greater part of the hydrosulphoeyanate of sinapine is precipitated, part however remaining dissolved in the

Sinapine cannot be obtained in the free state, because it quickly decomposes when separated from its salts. If baryta-water be added from a burette to aqueous bisulphate of sinapine, till the colourless solution turns yellow in consequence of the conversion of the acid sulphate into a neutral salt, a second quantity of baryta-water then added equal to the former, and the liquid filtered from the sulphate of baryta, an aqueous solution of sinapine is obtained, having a deep yellow colour and distinct alkaline reaction. This solution added to the solutions of many metallic salts precipitates the oxides (forming a green precipitate with copper-salts, yellow with mercuric salts and grey-brown with silversalts), and, on standing or heating, reduces the metal. (v. Babo & Hirschbrunn.)—Sinapine is not separated from its solution by alcohol or ether. Neither can it be obtained by treating the sulphate or hydrosulphocyanate with oxide of lead, the product thence resulting being a gelatinous compound containing lead, and somewhat soluble in boiling water. (v. Babo & Hirschbrunn.)

Sinapine is, according to v. Babo & Hirschbrunn, C38H24NO10, according to Gerhardt, it is C32H23NO10, which formula is here adopted.

Decompositions. 1. The aqueous solution of sinapine acquires by evaporation first a green, then a brown, and then a red colour, and does not leave a crystalline residue. - 2. Aqueous sinapine reduces gold from the terchloride. - 3. When its salts are mixed with aqueous alkalis or baryta-water, it instantly turns yellow, and is resolved on boiling into sincaline and a salt of sinapic acid. (v. Babo & Hirschbrunn.)

Decompositions of Hydrosulphocyanate of Sinapine. - 1. When heated, it melts to a yellow liquid, which then decomposes, giving off stinking products—among which are a brown oil, carbonate of ammonia and hydrosulphate of ammonia,—and leaving charcoal. (Henry & Garot.) Combustible gases are evolved in this decomposition. (Winckler.) The vapours do not smell of sulphuretted hydrogen, sulphide of carbon, or hydrocyanic acid. In the course of the decomposition, volatile bases are evolved, together with gases and empyreumatic oils, which burn with luminous flame and formation of sulphurous acid. (v. Babo & Hirschbrunn.) - 2. It dissolves readily in oil of vitriol, with greenish yellow colour and slight rise of temperature, turns brown when the solution is heated, and then chars. (Winckler.) Hydrosulphocyanic acid is likewise evolved. (v. Babo & Hirschbrunn.) — 3. With iodic acid, it acquires a light reddish brown colour and separates iodine (Winckler); probably because it contains free hydrosulphocyanic acid. (Kr.) — 4. In contact with iodine, it immediately assumes a light yellow-brown colour, and when heated, melts, gives off iodine, and leaves a brown-red brittle resin. (Winckler.) — 5. Its aqueous solution is coloured by chlorine, first brown-red, then red, and finally yellow, with formation of sulphuric and evolution of hydrocyanic acid. (Henry & Garot.) According to v. Babo & Hirschbrunn, no formation of hydrocyanic acid takes place in this and similar cases. — 6. With nitric acid of sp. gr. 1.4, or weaker, it immediately assumes a deep red colour, giving off red vapours, and when heated, turns yellow with formation of sulphuric acid. (Henry & Garot, and others.) — 7. When hydrosulphocyanate of sinapine is boiled with peroxide of manganese and dilute sulphuric acid, the distillate contains hydrocyanic acid (vid. sup.), and the residue contains a substance which dissolves in water with dark brown-red colour. (Winckler.) — 8. With alkalis (vid. sup.). It is likewise coloured yellow by the alkaline earths (Henry & Garot); and by ammonia, strychnine, morphine, and quinine (but not by narcotine or salicine). (Winckler.) A trace of tobaccosmoke is sufficient to produce this colouring. (v. Babo & Hirschbrunn.) — The behaviour of hydrosulphocyanate of sinapine to dilute acids and saline solutions is the same as that of other hydrosulphocyanates (comp. Henry & Garot, J. Pharm. 17, 10 and 11; Winckler, Repert. 41, 88.) — For its behaviour with sequichloride of iron, see Hydrosulphocyanate of Sinapine. According to Henry & Garot, oli of mustard is given off in many of the decompositions of hydrosulphocyanate of sinapine; but according to Boutron & Robiquet, v. Babo & Hirschbrunn, and others, this statement is erroneous.

Compounds of Sinapine. With water. — Aqueous Sinapine (vid. sup.) With Acids. — Salts of Sinapine. — Sinapine unites with acids, forming colourless salts, which are less decomposable than free sinapine (v. Babo & Hirschbrunn).

Sulphate of Sinapine. — a. Neutral — Half the acid of bisulphate of sinapine is precipitated by baryta-water, and the colourless filtrate is evaporated. — Colourless crystalline mass easily soluble in water (v. Babo & Hirschbrunn).

b. Acid. — When a small quantity of oil of vitriol is added to a hot concentrated solution of hydrosulphocyanate of sinapine in alcohol of 90 p. c., the liquid on cooling deposits rectangular laminæ, which may be purified by washing with absolute alcohol, and repeated crystallisation from water and alcohol. — Contains 4 At. water, which are given off at 110° (Will; Babo & Hirschbrunn).

	At 100°.			v	. Babo	& Hirschbrunn.
32 C		192	1111	47-19	********	46.99
						6.87
						0000
2 SO ³		80	****	19.66	*******	19.82
Cas Has NO 20	2803.2HO	407		100-00		

Hydrochlorate of Sinapine. — Slender very soluble needles, obtained by decomposing sulphate of sinapine with chloride of barium (v. Babo & Hirschbrunn).

Nitrate of Sinapine. — Obtained by decomposing the sulphate with nitrate of baryta, or the hydrocyanate with nitrate of silver. — Colourless, very soluble needles. (v. Babo & Hirschbrunn.)

Chloroplatinate of Sinapine. — When hydrochlorate of sinapine is mixed with bichloride of platinum, a resinous precipitate is formed, which turns brown when heated, and yields flocks. (v. Babo & Hirschbrunn.)

Hydrosulphocyanate of Sinapine. — Formation, Preparation, and Synonymes (pp. 523, 524). — White needles having a pearly lustre and loosely aggregated in tufts. (Henry & Garot.) Colourless, nearly transparent, glassy prisms, mostly rectangular, truncated, grouped in stars or thin nodules. (Winckler.) Melts when heated (at 130° according to v. Babo), forming a yellow liquid, which solidifies in a gummy mass on cooling. (Winckler.) Scentless, tastes bitter, then like mustard. Neutral. (Henry & Garot.) — Hydrosoulphocyanate of sinapine for the most part reddens ferric salts immediately, like other hydrosulphocyanates; sometimes, however, it is obtained in such a condition that it does not redden ferric salts till heat is applied. (Will; v. Babo & Hirschbrunn.) Boutron & Robiquet obtained hydrosulphocyanate of sinapine not possessing the power of reddening ferric salts, by treating mustard-flour with alcohol after it had been exhausted with ether. This variety of the compound contains, according to them, less nitrogen than that which reddens ferric salts, and is less soluble in alcohol. But Winckler, following their directions, obtained hydrosulphocyanate of sinapine which did possess the power of reddening ferric salts.—Hydrosulphocyanate of sinapine dissolves with yellow colour in water and in alcohol,—in greatly increased quantity when the liquid is hot, and crystallises on cooling. —A drop of acid renders the solution colourless (v. Babo & Hirschbrunn). —It likewise crystallises without alteration from acidulated water (Henry & Garot). —It dissolves in ether, sulphide of carbon and oil of turpentine. (Simon.) According to Boutron & Fremy, hydrosulphocyanate of sinapine is decomposed by emulsion, with formation of the acrid principle of white mustard. According to Simon, and v. Babo & Hirschbrunn, on the other hand, emulsin has no effect on it.

								Babo & rschbrunn.
34 C	***************************************	204		55.43	 57.92	****	54.06	 55-42
10 O		80	,	21:74	 19.68	****	23-08	 21-55
CarHa	NO2.C2NHS2	368		100.00	 100.00	100	100.00	 100:00

So, according to Gerhardt (Traité, 2, 426); v. Babo's formula contains I At, H more. Boutron & Robiquet's hydrosulphocyanate of sinapine did not redden ferric salts. — Comp. Henry & Garot (J. Pharm. 17, 1 and 20, 63); Pelouze (J. Pharm. 17, 271); Henry (J. Pharm. 17, 273); Henry fils (J. Chim. méd. 6, 582).

Appendix to Sinapine.

1. Acrid principle of White Mustard. — White mustard owes its sharpness, as appears from the preceding, not to hydrosulphocyanate of sinapine (neither can volatile oil of mustard be obtained from it by any treatment whatever), but to a non-volatile, easily decomposable substance.

perhaps containing sulphur. - This acrid principle is produced, according to Boutron & Fremy, by the action of emulsin on hydrosulphocyanate of sinapine; but Simon and Babo & Hirschbrunn could not perceive that any decomposition of hydrocyanate of sinapine was produced by emulsin. Winckler, on the other hand, thinks it more probable that hydrosulphocyanate of sinapine is a product of the decomposition of the acrid principle. (Repert. 67, 257.)

White mustard stirred up with water, yields a milk which has a mild odour, but sharp taste, and yields by distillation with water, not a trace of mustard-oil, but only insipid water, the residue also losing its acridity.

(Boutron & Robiquet.)

Alcohol of 94 p. c. or absolute alcohol does not extract any acrid principle from white mustard; the residue no longer becomes acrid when moistened with water. (Simon.) The alcoholic tincture has a sharp taste at first, but loses its sharpness by evaporation, and then yields crystals of hydrosulphocyanate of sinapine. (Winckler.)

Ether does not extract any acrid principle from the seeds, after they

have been freed from oil.

The acridity of aqueous mustard-paste is destroyed by heating, even below the boiling point, and without evolution of acrid vapours; also by addition of alcohol or of dilute carbonate of potash, and is not restored by acids. It is destroyed by drying the paste, even by quick and careful drying in vacuo, and remains in the residue when an aqueous emulsion of mustard is filtered, the filtrate being insipid. (Simon.)

When white mustard is moistened with water, the acrid principle thereby developed may be completely extracted by ether, so that the ethereal liquid, if allowed to run over the hand, produces a roseate inflammation, attended with pain which lasts for several days. (Alcohol extracts from the residue very pure hydrosulphocyanate of sinapine, which therefore is not the cause of the acridity.) The ether, when distilled, leaves a very acrid and acid extract, the alcoholic solution of which separates on standing, into two layers, with evolution of sul-phuretted hydrogen and separation of resin. The lower resinous layer is with difficulty deprived of all its acid (Simon's Senfsäure p. 523) by cold water, more easily by warm water (but with evolution of sulphuretted hydrogen) or by alkalis. At the same time it loses all its acridity. The acrid and acid resin contains sulphur; that which has been deprived of

its acridity is free from sulphur. (Simon, Pogg. 43, 651, and 44, 593.)

When a pressed cake of white mustard is exhausted with ether in the displacement apparatus, a mild fixed oil first runs away, then an acrid ethereal tincture. The latter leaves on evaporation an acrid oil, which, when repeatedly agitated with cold alcohol, gives up to that liquid its acrid principle, together with a small quantity of oil, which may for the most part be separated by repeatedly evaporating the alcohol and redissolving the residue in alcohol. In this manner, the acrid principle is obtained as a thick reddish oil, scentless, with a biting taste of horse-radish, soluble in alcohol and in ether. This oil burns when heated, without leaving any fixed residue, and does not yield any volatile acrid principle by distillation with potash or ammonia. (Boutron & Robiquet, J. Pharm.

17, 279.)

2. Erucine. - When white mustard-flour is moistened with water and then exhausted with ether, the ether distilled off from the acrid extract, and the acrid residue left to itself for some time in an open dish,

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some mer is free tree of rest to secretary with a receive alightthen dissover it store remaining account the management of the evaporate in the air the account nature remaining with amount of the evaporate rest it on the less traces of amounts by succeeding with amounted while their dissover it store much be evaporated. First, then the management while moving with an evaporate. First, then the event management of the large much along the store which in the event manage it management is a large much in the second display they are stored in substance of them. They are that it is presented, slightly they it realists are assumed. Since the file.

Trimum Property Victors (**22).

Emely alicityis.

 $(\mathbf{r}_{\mathbf{H}}^{\mathbf{a}})^{\mathbf{a}} = (\mathbf{r}_{\mathbf{H}}^{\mathbf{a}})^{\mathbf{a}}$

This loosy is necessaring to a limited the chief constituent of volatile of the publish.

Digitaloic Acid.

 $C^{\pm}H^{\pm}O^{+} = C^{\pm}H^{\pm}O^{+}.$

Walz. 1858. N. Jakes. Phoen. 8, 310; further, 10, 324.

Respecting Kosmata's futty and from Deptitally and Morin's digitalic and m Deptitable.

From commercial digitalize and in ether extracts Walz's digitalsons or digitalieriz, which by the treatment presently to be described, yields digitalin- at the acrid principles of digitalis. A and B, and digitalist arti. - Walz's digitalin ric. art is digested with absolute other; and the residue left after the distillation of the other is washed with water s ling as the water which runs away from it has a bitter taste and then drie l. The product thus obtained was formerly described by Walz, Jahrbr. p. Phr. m. 21, 40, as digitalicrin. On digesting the brownish, crumbling mass thus obtained with alcoholic solution of subacetate of lead, that substance takes up the colouring matter, and the wine-yellow filtrate leaves on evaporation 'after removal of the lead? Kr.) a gold-yellow resin. The resin is freed by agitation with water from admixed digitalin and its products of decomposition; the undissolved portion (Walz's digitalacrin, N. Jahr). Pharm. 9, 311; is digested with water containing a few per cent. of ammonia; and the white flocks which separate are filtered from the brown solution and completely washed with ammoniacal water. The ammoniacal solution contains the acrid principle A; rid. inf.) The undissolved hite flocks, containing digitaloic acid and the acrid principle B. are shed with cold alcohol, and the residual shining white mass is dissolved boiling alcohol. The solution thus formed yields, on cooling, white

pearly laminæ of digitaloic acid, an additional quantity of which is obtained by concentrating the mother-liquor, and likewise by precipitating with water the cold alcohol which has been used for washing. Part of the digitaloic acid still remains in solution, together with the acrid principle B: to separate these substances, the liquid is evaporated, and the residue, which solidifies to a white jelly, is digested with potash-ley and thoroughly washed. Digitaloic acid then remains behind, while the acrid principle B dissolves. The latter is precipitated with dilute sulphuric acid, dissolved in alcohol, and treated with animal charcoal (which however exerts a decolorising action), and obtained in the solid state by spontaneous evaporation of the solution.

Properties. Oblique truncated prisms, scentless at first, afterwards

smelling of fat.

C22H22O4	186		100.00	********	100.00
40	32		17:22		17.24
22 H	22	****	11.82	******	11.90
22 C	132	***	70.96	******	70.86
					mean.
					Walz.

It is not easy to see why Walz designates this body as an acid, inasmuch as it is insoluble in alkalis.

Insoluble in ammonia, or in potash, but soluble in alcohol.

Appendix to Digitaloic Acid.

1. Digitalin-fat.

WALZ. N. Jahrb. Pharm. 9, 312; further, 10, 324.

Extracted by ether from crude digitalin, together with the substances above mentioned, and remains—in the preparation of digitaloic acid as above described—dissolved in the aqueous ammonia, together with the acrid principle A.—When this ammoniacal solution is neutralised with dilute sulphuric acid, a copious white precipitate is formed, which soon unites with the resin. The resin is dissolved in alcohol; the solution precipitated with alcoholic subacetate of lead (the acrid principle A then remaining dissolved); and the precipitate is completely washed with alcohol and decomposed under alcohol, with sulphuretted hydrogen. The solution filtered from the sulphide of lead leaves, by spontaneous evaporation, digitalin-fat in white scales, which melt to an oil at a gentle heat:

23	H	***************************************	23	****	11.21		
----	---	---	----	------	-------	--	--

Walz calculates his analyses incorrectly. He regards the fat as consisting of an acid C²²H²²O⁴ and Berzelius's oxide of lipyl (ix, 487) C³H²O; or perhaps also as 2 M 2

CPEROF. produced from 3 At CFHFOF and 1 At. CPHFOF. According to the first of times from a.e. the acred principles A and B of digitalis consist of digitalin with 2 and i di inggen nabbel in ii.

2. Acrid Principle of Digitalis, A.

Walk. N. Jair. Pharm. 9, 314; 10, 324.

Extracted by ether, together with other substances, from crude digimir, and remains in the preparation of digitalin-fat, as above in solution to the evaporation of which it is left in the form of a resis-Separates by spontaneous evaporation from alcohol, at the bottom of the vassel in vell: with red off-drops, on the edge in warty resinous spheroles, and agreementation complete evaporation of the alcohol, as a yellowish mass maring the consistence of honey.

	Celevisium eccording to We		Mak.
25 C 68-3 25 H 10-4 5 O . 21-3	0 25 H 9-85		68·15 9·61 22·21
CBH=Of _ 100-0	O C≅H≅O' 100-00	СиНзиОю 100-00 1	00-00

Wair is undecided between these formula: the relations of this body to the other consistents of matthe may be seen under Digitaliretin and Digitalin-fat (p. 530).

Describes. 1. When heated, it gives off a smoke having a perliar of tr and at a higher temperature burns away without residue.—
2. Blackens with property dissolves with brown colour in funny To is instable in water, but imparts to the liquid its acid reactive

and very sharp taste. Soluble in alcohol and in ether.

3. Acrid Principle of Digitalis B.

WALE. (1858. N. Jahrs. Pharm. 9, 314; further, 10, 324.

Properties. See Digitaloic Acid. p. 529.)

Uniform, vellowish mass, friable at ordinary temperature, melting at 100°, and solidifying again but slowly. Its aqueous solution has a lurning taste and slight acid reaction.

	Cal	culations accord	ling to Wa	lz.		Wals. Meel
23 C 23 H 7 O	(5:5 10:0 24:5	32 C 29 H 9 O		40 C 35 H 11 O	9.64	9:
C-H2O.	100.0	Cz.H.; O	. 100.00	C*(Hz;O:1	100-00	learn d

Wale is undecided between these formulæ: the relations of the compound to the other prestituents of digitals may be seen under Digitaliretin and Digitalin-fat p. 530.

Turns brown in contact with oil of vitriol, and olive-green with hydrochloric acid, which partially dissolves it. Dissolves with yellow colour in nitric acid.

Scarcely soluble in water, easily in ether. (Walz.)

4. Digitalosmin.

WALZ. (1852.) N. Jahrb. Pharm. 24, 86.

The odorous principle of fox-glove (Digitalis purpurea).

On subjecting 80 pounds of dry fox-glove a year old to slow distillation by steam, 15 to 18 lbs. of slightly acid distillate were obtained, with fatty scales floating on the surface. By agitating the distillate with ether, removing the ethereal layer, and leaving the ether to evaporate, the substance composing these scales is obtained as a yellowish white, pearly residue, having a strong odour of infusion of digitalis, and a nauseating, scratching, very persistent taste.

Heated on platinum, it melts and volatilises in vapours, which burn

Heated on platinum, it melts and volatilises in vapours, which burn with a non-smoking flame. — Softens when triturated with oil of vitriol, and is decomposed by heating. — It is slightly altered by cold fuming nitric acid, and coloured yellow by hot nitric acid, with evolution of nitrous

gas.

It is insoluble in cold water, but imparts to it the odour of digitalis; in warm water, it melts and separates in scales on cooling. It dissolves in alcoholic potash, and is precipitated apparently unaltered by water. In aqueous ammonia, it softens without dissolving.

It dissolves readily in alcohol, with slight coloration, and is precipi-

tated therefrom by water. - Dissolves with great facility in ether.

Oxygen-nucleus C22H16O6.

Volatile Oil of Aristolochia Clematitis.

? C22H16O6.

G. F. WALZ. Jahrb. pr. Pharm. 24, 65.

The volatile oil of Aristolochia was previously observed by F. L. Winckler (Jahrb. pr. Pharm. 19, 71) and by Frickhinger (N. Repert. 7, 1). — Winckler obtained about 0.4 p. c. by distillation from the dried roots; Walz obtained the oil from the dried plant by vapour-distillation.

Viscid, gold-yellow oil, having a sp. gr. of 0.903 at 15° and a strong acid reaction (arising probably from adhering acid: Kr.).

16 H 6 O	48	****	24.50	********	24.84
22 C	132	****	67:34	,,,,,,,	Walz. mean. 66.51

Wals heated the oil that he analysed to 100° for some time previously, which temperature was probably not sufficient for dehydration. The calculations of his analyses, which vary from 65·18 to 67·18 p. c. in the carbon, and from 7·98 to 9·26 p. c. in the hydrogen, are partly incorrect. (Kr.)

By exposure to the air, the oil becomes more viscid, but does not resinise. - According to Winckler, it resinises when exposed to the air. - It colours oil of vitriol liver-brown when cold, black when heated, and finally becomes carbonised. — It dissolves iodine with rise of temperature, forming a yellowish brown, tough mass, which resinises when heated. -By nitric acid of sp. gr. 1.5, it is violently attacked, with evolution of nitrous gas, becomes brown-red and resinises. — With alcoholic potash, it forms a deep red liquid, becoming red-brown when boiled, and remains in red drops when the alcohol evaporates. — With coustic ammonia it forms an orange-yellow emulsion. With aqueous bichromats of potash and salphuric acid it acquires a yellow-green colour.

Dissolves in 15—28 pts. alcohol of sp. gr. 0.85.

ERRATA.

VOL. XIII.

Page 576, lines 9-20 belong to page 577 where they should follow line 9.

VOL. XIV.

Page.	Line.				
139	9 from bottom	for	2BaO, HO	read	2(BaO, HO).
140	5 from top	,,	3BaO,HO	"	3(BaO, HO).
,,	11 from bottom	,,	3CaO, HO	,,	3(CaO, HO).
158	21 from top	,,	C ₁₆	9.0	C ¹⁴ .
176	11 ,,	,,	CaoNH11O4	1,	CMNHIO1.
268	17 ,,	,,	HQ	29	HCl.



REPORT

OF

THE THIRTEENTH ANNIVERSARY MEETING

OF THE

CAVENDISH SOCIETY.

THE Anniversary Meeting of the Cavendish Society for the year 1860, was held at the rooms of the Chemical Society, in Burlington House, on Thursday, the 1st of March, at three o'clock in the afternoon.

The Chair was taken by Thomas Graham, Esq., F.R.S., President, who called upon the Secretary to read

THE REPORT OF THE COUNCIL.

"In the last annual report the Council stated that the thirteenth volume of GMELIN'S 'Hand-book of Chemistry' was then in progress, and was intended as a book for 1859. The completion of this volume has occupied a longer time than was anticipated, partly in consequence of the Editor baving to wait for a portion of the German edition which is comprised in it, and partly in consequence of the extensive additions of new matter which had to be made in the form of appendix. It is now ready for distribution, and the large amount of matter it contains will, it is hoped, compensate in some degree for the unavoidable delay that has occurred in supplying it to the members.

"The Council are unable to hold out the prospect of any other volume being supplied for 1859, and must refer to the statement mais in the last report for an explanation of the causes which have contributed to limit the issue of books during the last two or three years.

"The propositions, originating from several sources, which have been made with reference to works thought to be suitable for publication by the Society, and some of which were referred to in the last annual report, have received the attention of the Council, and have been fully discussed on repeated occasions. The conclusion to which the Council have arrived, after mature consideration, accords with the opinion expressed in the report of last year, which is, that the whole of the resources of the Society should be concentrated upon the completion of the few remaining volumes of GMELIN's 'Chemistry' before any other work is undertaken. This opinion, they have reason to believe, is also in accordance with that of the majority of the members of the Society. In the present state of the Society, the attempt to bring out any other work in conjunction with the ' Hand-book of Chemistry' would necessarily retard the completion of the latter, as the means at the disposal of the Council are insufficient for the preduction of more than one large volume a year; while an apparently insurmountable obstacle is presented to the extension of the number of subscribers, by the necessity imposed on new members to provide a large number of the preceding volumes of the work now in progress in order to make their sets complete. Attempts have been made to overcome this difficulty, but without success; and even if, in other respects, it were possible, the small stock of the early volumes left an hand would so far limit the power of enlarging the Society in that way, that no sufficient increase could be derived to justify any material augmentation in the expenses of publication.

"The present income of the Society, if maintained, will be sufficient to enable the Council to bring out what remains to complete the Work of Leopold Gmelin as fast as it is produced by the German editors; and at the same time to add, in the form of appendix, all new matter relating to those parts of organic chemistry treated of in the preceding volumes. The matter thus added to the volume now in course of distribution, occupies two hundred pages. These additions, which are made to each succeeding volume of the work, may be regarded as 'Annual Abstracts of Papers on Chemical Science,' which

some of the members of the Society suggested to the Council, in a communication noticed in the last annual report, as suitable for publication. The Council are glad to be enabled thus far to meet the wishes expressed by members, without retarding the progress of the Work which all seem desirous to expedite, or involving the Society in liabilities beyond the current income.

"A new part of the German edition of the Hand-book has just appeared, the translation of which will at once be proceeded with; and there is every reason to believe that the supply of matter will be kept up so as to admit of the publication of a volume, with the usual additions, or abstracts of Papers, every year, until the completion of the Work.

"The preparation of an Index to the whole of the volumes is now occupying the attention of the Council.

"When GMELIN'S Work has been brought to a conclusion, a suitable opportunity will be presented for considering the course to be pursued with reference to the future. The obstacle to the extension of the Society, to which allusion has been made, will then cease to exist. New works may be undertaken, for the selection of which ample time will have been afforded. These may resemble in character the works previously produced, or it may be thought desirable to undertake works of a different description, which would attract a new class of members, and the extension or reconstruction of the Cavendish Society would be the probable result.

"The Council feel, however, that they cannot too strongly impress upon the members the importance of retaining the support of all the present subscribers to the Society, until the Work on which they have been so long engaged is brought to a satisfactory conclusion."

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the CAVANDIAN	ebruary, 1860.
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Pebruary 29, 1860.

DANE, HANBURY.

97 American Subscriptions, less Agency 92 3 Sale of Books 192 2 It was moved by Dr. Roscoe, of Manchester, seconded by Daniel Hanbury, Esq., and resolved unanimously—

"That the Report just read be received, approved, and adopted."

The Meeting then proceeded to the election of Officers for the ensuing year, and the following Gentlemen were declared to have been duly elected:—

President.

THOMAS GRAHAM, F.R.S.

Wice-Presidents.

PROFESSOR BEANDE, F.R.S.
EARL OF BURLINGTON, F.R.S.
WALTER CRUM, F.R.S.
JOHN DAVY, M.D., F.R.S.
CHARLESG. B. DAUBENY, M.D., F.R.S.
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Creasurer.

GEORGE DIXON LONGSTAFF, M.D., 9, Upper Thames Street.

Secretary.

THEOPHILUS REDWOOD, Ph. D., 19, Montague Street, Russell Square.

Collector.

Mr. Thomas West, Burlington House, Piccadilly, W. Agent for the Bistribution of Books, &c. Mr. F. Harrison, 59, Pall Mall, S.W.

It was resolved-

"That Dr. Frankland and Messrs. Thomas Hyde Hills and Alfred Smee be appointed Auditors for the ensuing year."

The following Resolutions were unanimously adopted:-

"That the thanks of the Meeting be given to the PRE-SIDENT, COUNCIL, and OFFICERS, for their services to the Society."

"That the thanks of the Meeting be given to the Honorary LOCAL SECRETARIES for their services to the Society."

"That the thanks of the Meeting be given to the CHEMICAL SOCIETY for the use of their rooms."

THEOPHILUS REDWOOD, SECRETARY, 19, Montague St., Russell Square, & 17, Bloomsbury Square.

MARCH, 1860.

OBJECTS, &c., OF THE CAVENDISH SOCIETY.

The Cavendish Society was instituted for the promotion of Chemistry and its allied sciences, by the diffusion of the literature

of these subjects.

WILSON.

The subscription, constituting membership, is one guinea a-year, to be paid in advance; and the subscription becomes due on the 1st of January of each year. A member is entitled to a copy of every book published by the Society for the year for which he has subscribed, but no member can receive the Society's publications until his subscription has been duly paid.

WORKS OF THE CAVENDISH SOCIETY.

1848.

1.—CHEMICAL REPORTS AND MEMOIRS. Edited by Thomas GRAHAM, F.R.S. (Out of Print.) 2.—HAND-BOOK OF CHEMISTRY. By LEOPOLD GNELIN, Trans-lated by Henry Watts, B.A., F.C.S. Vol. I.

3.—HAND-BOOK OF CHEMISTRY. By Leopold GMELIN. Vol. II. 4.—HAND-BOOK OF CHEMISTRY. By Leopold GMELIN. Vol. III. 5.—THE LIFE AND WORKS OF CAVENDISH. By Dr. George

1850.

6.—HAND-BOOK OF CHEMISTRY. By LEOFOLD GMELIN. Vol. IV. 7.—HAND-BOOK OF CHEMISTRY. By LEOFOLD GMELIN. Vol. V.

8.—PHYSIOLOGICAL CHEMISTRY. By PROPESSOR LEHMANN.
Translated by George E. Day, M.D., F.R.S. Vol. I. (Out of Print.)

9 .- HAND-BOOK OF CHEMISTRY. By LEOPOLD GMELIN. Vol. VI.

1852.

10 .- HAND-BOOK OF CHEMISTRY. By LEOPOLD GMELIN. Vol. VII.

(Organic Chemistry, Vol. I.)

11.—PHYSIOLOGICAL CHEMISTRY. By Professor Lehmann, Vol. II.

12.—ATLAS OF PLATES RELATING TO PHYSIOLOGICAL CHEMISTRY. TRY. By Dr. Otto Funks. (Supplement to Lehmann's Physiological Chemistry.)

1853.

13,-HAND-BOOK OF CHEMISTRY. By LEOPOLD GMELIN. Vol. VIII. (Organic Chemistry, Vol. II.)

14.—ELEMENTS OF CHEMICAL AND PHYSICAL GEOLOGY. By PROFESSOR BISCHOF, Vol. I.

1854.

15.—THE LIFE AND SCIENTIFIC RESEARCHES OF DALTON. By Dr. W. C. Henry, F.R.S.

16.-PHYSIOLOGICAL CHEMISTRY. By PROFESSOR LEHMANN. Vol. III.

17 .- LAURENT'S CHEMICAL METHOD. Translated by WM. ODLING, M.B.

18 .- HAND-BOOK OF CHEMISTRY. By LEOPOLD GMELIN. Vol. IX.

(Organic Chemistry, Vol. III.)
19.—ELEMENTS OF CHEMICAL AND PHYSICAL GEOLOGY. By PROFESSOR BISCHOF. Vol. II.

20.-HAND BOOK OF CHEMISTRY. By LEOPOLD GMELIN. Vol. X. (Organic Chemistry, Vol. IV.) 21.—HAND-BOOK OF CHEMISTRY, By LEOPOLD GMELIN. Vol. XII.

(Organic Chemistry, Vol. VI.)

1857.

22.-HAND BOOK OF CHEMISTRY, By LEOPOLD GMELIN. Vol. XI. (Organic Chemistry, Vol. V.)

1858.

23.—ELEMENTS OF CHEMICAL AND PHYSICAL GEOLOGY. By Professor Bischof. Vol. III.

1859.

24.—HAND BOOK OF CHEMISTRY, By LEOPOLD GMELIN. Vol. XIII. (Organic Chemistry, Vol. VII.)

CHEMICAL REPORTS AND MEMOIRS. Edited by PROFESSOR GRAHAM. This work is out of print,

GMELIN'S HAND-BOOK OF CHEMISTRY. Translated and Edited by HENRY WATTS, B.A., F.C.S.

The first Volume of this Work treating of Physics, is out of print. The Five Volumes, from Vol. II to Vol. VI, com-

prising the Inorganic Chemistry, may be obtained for £1 5 0. The 7th and 8th Volumes, being the first two volumes of the

part treating of Organic Chemistry, for The 9th and 10th Volumes, for 1 1 0

The subsequent volumes can only be obtained by subscribing for the years for which they are issued.

LEHMANN'S PHYSIOLOGICAL CHEMISTRY. Translated and

Edited by DR. G. E. DAY, F.R.S.

The First Volume of this work is out of print. There still remain a few copies of the Second and Third Volumes, and of Dr. Otto Funke's Atlas of Physiological Plates, which, together, may be obtained for £1 1s.

BISCHOF'S ELEMENTS OF CHEMICAL AND PHYSICAL GEOLOGY ..

The First and Second Volumes of this Work are supplied for a subscription of £1 1s.

THE LIFE AND WORKS OF CAVENDISH. By Dr. GEO. WILSON. THE LIFE AND SCIENTIFIC RESEARCHES OF DALTON. By Dr. W. C. HENRY, F.R.S.

LAURENT'S CHEMICAL METHOD. Translated by Dr. ODLING. These three Works are supplied for a subscription of £1 1s.

^{*} Applications for the works of the Cavendish Society, are to be made to the Agent, Mr. Harrison, 59, Pall Mall, S.W.

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